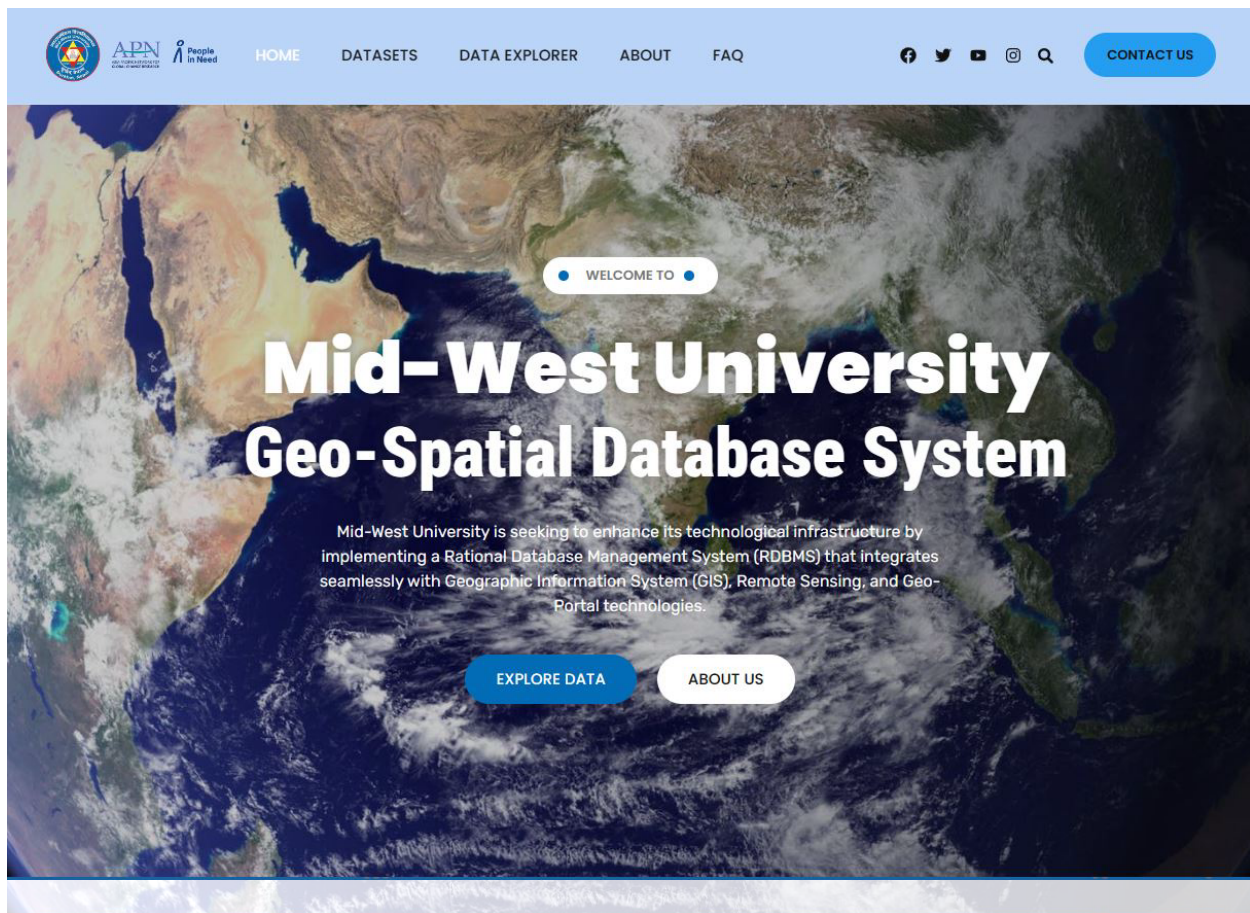




# GEOSPATIAL DATA MANAGEMENT WEB PORTAL DEVELOPMENT REPORT



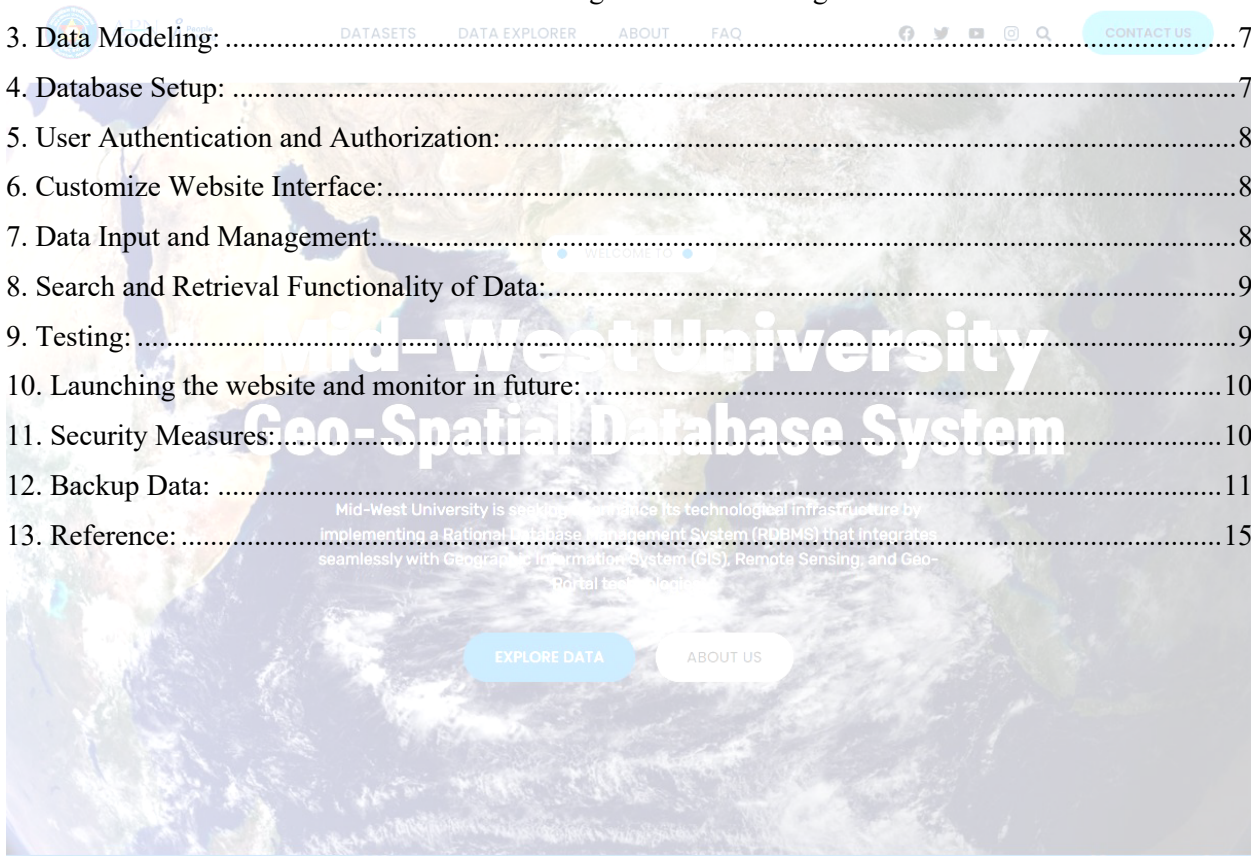
***Prepared by***

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## 1. Background:

Nepal, a diminutive landlocked country nestled in the mountains of South Asia, spans between latitudes 26°22'N to 30°27'N and longitudes 80°04'E to 88°12'E, sandwiched between India and China. Covering an area of 147,181 square kilometers, it is home to a population of 23.4 million individuals. Remarkably diverse, Nepal boasts a rich human culture, embracing over 61 ethnic groups and a linguistic tapestry woven from 70 spoken languages. Despite its modest size, accounting for only 0.1% of the Earth's expanse, Nepal stands out as a sanctuary for biodiversity. This small nation harbors 2% of the world's flowering plants, a staggering 8% of the global bird population (comprising over 848 species), 4% of Earth's mammals, and 11 of the world's 15 families of butterflies, totaling more than 500 species. Further, it boasts 600 indigenous plant families and hosts 319 species of exotic orchids. However, in stark economic contrast, Nepal faces challenging circumstances. The per capita income is a meager US\$ 240, reflecting economic constraints. A poignant gauge of societal well-being in Nepal is the substantial portion of the population—38%—living below the poverty line. Despite its ecological richness, economic challenges underscore the need for concerted efforts to improve living standards in this enchanting nation. Nepal faces the complex challenges posed by a diverse topography and fragile geological conditions, further exacerbated by widespread poverty and prevalent illiteracy. Central to the hurdles in Nepal's development is the pervasive problem of 'poor management.' A critical deficiency in the Nepalese management process stems from the insufficient incorporation of geographic information in decision-making, resulting in suboptimal management practices. Recognizing and aiming to rectify this gap, The **Mid-West University**, in collaboration with the **Asia Pacific Network (APN)** and **People in Need (PIN)**, is set to launch the Geospatial Portal in 2023. This initiative seeks to leverage geospatial data to enhance decision-making processes and address the challenges posed by Nepal's intricate socio-economic and environmental landscape.

### 1.1 Topographic Mapping: A Overview

The inception of GIS activities in Nepal dates back to the Eighth Plan period (1992-1997). However, a lack of a national perspective during this time resulted in the sporadic creation of spatial databases and the emergence of independent and isolated systems. The initial focus of these systems was on the digitization of existing 1” to one-mile topographic maps from the 1950s and



60s, leading to duplications of resources in outdated efforts. The Ninth Plan (1997-2002) highlighted the significance of GIS on multiple occasions, emphasizing the need for reliable information and data in various domains such as agriculture, forest production, land-use, land consolidation, housing and physical plans at local and regional levels, environmental programs, and poverty alleviation initiatives for sustainable development. The Tenth Plan (2002-2007) further emphasized the importance of a "national" geographic information system, outlining key sectoral policies and strategies. It explicitly stated the pursuit of the development of a national geographic information system to facilitate easy access and dissemination of geographic information. During the period from 1992 to 2001, the Survey Department responded to the evolving landscape by publishing an entirely new series of topographic base maps. These maps, produced at a scale of 1: 25,000 for the Terai and the middle mountains, and at a scale of 1: 50,000 for the high mountains and Himalayas, replaced the outdated one-inch to one-mile maps. This overhaul marked a significant step forward in the country's efforts to modernize and enhance its geospatial infrastructure.

The Geospatial Data Management Platform is a pivotal initiative designed to offer a holistic solution for handling geospatial data within the data center of the Graduate School of Science and Technology at Mid-West University located in Birendranagar, Surkhet. The primary focus of this platform is to facilitate the seamless collection, storage, analysis, and visualization of diverse geospatial data sets, catering to the specific needs of the academic institution. The Geospatial Database Management Web Portal Development team, operating under the Mid-West University collaboration with Asia Pacific Network (APN) and People in Need (PIN), is a specialized unit committed to assisting the general public in visualizing geographic relationships among programs, individuals, and the environment. Collaborating closely with Missions and operating units, the team applies geographic analysis to address development challenges. The overarching objective of the Web Portal Development is to enhance the efficiency and effectiveness of researchers and students by bolstering the Agency's capability to integrate geography into the design, implementation, monitoring, and evaluation of national development programs.

This Web Portal Development services are strategically aligned with several key focus areas:

- **Requests for Specific Mapping and Analysis:** The team addresses specific mapping and analysis needs, catering to the diverse requirements of users.

- **Establishing Resources and Methods to Collect, Manage & Share Data:** The team is dedicated to creating robust resources and methodologies for the collection, management, and sharing of geospatial data, ensuring accessibility and reliability.
- **Exploring Innovative Approaches to Gathering and Using Geographic Data:** Embracing a forward-looking approach, the team actively explores innovative methods for gathering and utilizing geographic data, staying at the forefront of technological advancements.

Through these comprehensive services, the Geospatial Database Management Web Portal Development team plays a pivotal role in advancing the capabilities of the Agency, contributing to more informed decision-making in the realm of national development programs.

## **2. Website Building Process:**

### **2.1. Geo-Database Website Objectives and Requirements:**

*Description of the website:* A geodatabase management website is designed with the overarching goal of efficiently handling geospatial data, serving as a centralized hub for users to store, organize, and retrieve spatial information. The first set of objectives revolves around establishing a structured database capable of capturing diverse geospatial data types, from simple points to complex polygons. This involves creating interactive maps that facilitate user-friendly visualization and exploration, as well as implementing spatial analysis tools to measure distances, calculate areas, and identify patterns within the data. Additionally, the website aims to foster a collaborative community, encouraging users to share and contribute to the geodatabase. Implementing robust user roles and permissions ensures secure data access and privacy controls.

The second set of objectives focuses on user interaction and data management. The website provides powerful search functionalities, allowing users to efficiently query and retrieve specific geospatial information. Filtering options further refine data queries, enhancing the precision of information extraction. The platform facilitates user-driven content creation by enabling data editing, modification, and validation. Integration with external GIS services enhances mapping capabilities and ensures cross-platform compatibility, fostering interoperability with various GIS software. Comprehensive documentation and training materials are integral to supporting users, offering guides and resources to navigate the geodatabase effectively. Through these objectives, a



geodatabase management website aspires to be a dynamic and user-centric platform, empowering individuals to contribute to and derive valuable insights from spatial data.

**Contents:** The content of a geodatabase website serves as a comprehensive guide for users, starting with the home page's welcoming message and a clear mission statement outlining the website's objectives. Featured content on this page should highlight key features, sparking users' interest in the capabilities of the geodatabase. The "About Us" section provides background information on the website's development, offering insights into its inception and the team or organizations behind its creation. "Getting Started" content details the user registration process, emphasizing the benefits of creating an account. Tutorial videos accompany this section, guiding users through website navigation, data input, and the utilization of key features.

Further content is dedicated to specific functionalities, including data input and management guidelines, interactive maps, spatial analysis tools, and search functionalities. Instructions on using data entry forms, editing, validation processes, and effective search and retrieval tips empower users to interact with the geodatabase seamlessly. The "Community and Collaboration" section encourages user engagement through a community forum and emphasizes opportunities for user contributions. "Security and Privacy" content details user roles, permissions, and the security measures implemented to protect user data, ensuring a secure and trustworthy user experience. The website also includes a "Documentation and Help Center" with user guides, FAQs, and contact information for user support. Finally, regular news and updates keep users informed about the latest features, improvements, and relevant blog posts, creating an engaging and informative experience for all users.

## **2.2. WordPress website as a Platform to create geo-database management:**

Creating a geodatabase website using WordPress involves leveraging the platform's flexibility and various plugins tailored for geospatial functionalities. WordPress serves as the content management system, allowing users to easily organize, update, and publish content. To transform it into a geodatabase site, plugins like Geo Directory, Leaflet Maps Marker, or WP Google Maps can be integrated, providing features such as data entry forms, interactive maps, and spatial analysis tools. WordPress also supports the integration of external GIS services or APIs, expanding mapping capabilities. Users can contribute, edit, and manage geospatial data through user-friendly

interfaces, while security measures, documentation, and community engagement features enhance the overall user experience. This approach enables the creation of a dynamic and user-centric geodatabase website without the need for extensive coding or technical expertise.

### **3. Data Modeling:**

In the development of a geodatabase management website on the WordPress platform, the process of data modeling and design is instrumental for structuring and organizing geospatial information efficiently. Begin by clearly defining the spatial entities your website will manage, such as points, areas, or routes, and outline the attributes associated with each entity. Choose an appropriate GIS data format like GeoJSON or KML for seamless integration with WordPress and compatible plugins. Establish a well-structured database table for each spatial entity, considering fields like ID, Name, Description, Latitude, and Longitude. Implement spatial indexing to optimize data retrieval, enhancing the performance of spatial queries. Utilize WordPress taxonomies for categorizing data hierarchically, providing an additional layer of organization.

Furthermore, create user-friendly data input forms aligned with the defined data model, incorporating validation mechanisms to ensure data integrity. Integration with mapping plugins like Leaflet Maps Marker or WP Google Maps is crucial for visualizing and interacting with geospatial data. Responsive design principles should be applied to guarantee a consistent and user-friendly experience across various devices. In essence, a thoughtful approach to data modeling and design establishes the groundwork for a robust geodatabase management website, where spatial data is organized logically, input is user-friendly, and visualization is seamless.

### **4. Database Setup:**

In setting up the database for a geodatabase management website on WordPress, the focal point is establishing a spatially-aware database system to efficiently store and manage geospatial data. Begin by selecting a suitable database management system with spatial capabilities, such as PostgreSQL with the PostGIS extension. Create dedicated tables within the database to correspond with the defined spatial entities, ensuring each table aligns with the identified attributes and relationships. Establish seamless communication between WordPress and the spatial database, often achieved through plugins or direct integration, to facilitate the smooth storage and retrieval of geospatial information. This robust database setup not only forms the backbone of the



geodatabase management website but also ensures a foundation capable of handling the intricacies of spatial data in a coherent and optimized manner.

### **5. User Authentication and Authorization:**

Users are required to provide name, email address and maybe phone number to download data from the website. The purpose of this requirement is to ensure proper authentication and authorization of users on the website.

### **6. Customize Website Interface:**

Customizing the website interface for a user-friendly and responsive experience is essential in ensuring a positive interaction with the geodatabase management website built on WordPress.

Begin by adopting a clean and intuitive design, incorporating a user-friendly navigation structure that guides users seamlessly through various sections of the site. Utilize clear and visually appealing typography to enhance readability, and maintain a consistent color scheme and layout across pages for a cohesive look. Prioritize a responsive design approach, ensuring the website adapts seamlessly to different screen sizes and devices, enhancing accessibility and usability for users on desktops, tablets, and mobile devices. Implement interactive and intuitive elements such as easily accessible menus, well-designed buttons, and tooltips to guide users through the functionalities of the website. By prioritizing these design principles, the customized interface not only enhances user satisfaction but also ensures a seamless and visually pleasing experience across a variety of platforms.

### **7. Data Input and Management:**

In the geo-database management WordPress website, data input and management are centralized functions primarily managed by administrators. Admins have exclusive access to user-friendly input forms designed to capture and organize geospatial details efficiently. These forms are tailored to gather information such as location coordinates, descriptions, and metadata, maintaining a structured and accurate database. The system prioritizes security and control, limiting data input capabilities to administrators to ensure data accuracy and integrity. Admins also possess tools to edit and manage the contributed data, allowing for ongoing refinement and maintenance of the geodatabase. This streamlined approach ensures that data input and



management are controlled by authorized personnel, optimizing the accuracy and reliability of the geospatial information stored in the database.

## 8. Search and Retrieval Functionality of Data:

The WordPress search functionality within the geo-database management website is a powerful tool designed to enhance user experience and facilitate efficient data retrieval. It allows users to search for specific geospatial information quickly and accurately. Leveraging this feature, users can enter keywords, locations, or attributes related to the spatial data they are seeking. The search functionality is designed to be intuitive and user-friendly, providing relevant results based on the input parameters. Additionally, the website incorporates filtering options that enable users to refine their searches, ensuring a more targeted and precise retrieval of geospatial data. This search feature enhances the overall accessibility of the website, enabling users to locate specific points of interest or areas within the geodatabase seamlessly.

## 9. Testing:

WordPress websites are thoroughly tested by developers to ensure their functionality, security, and overall performance. This testing process involves several key aspects to guarantee a robust and user-friendly website. Firstly, developers conduct functional testing, meticulously checking each feature and component of the website, such as navigation menus, forms, and interactive maps, to ensure they operate correctly.

Compatibility testing is also crucial, as developers assess the website's performance across various browsers and devices to ensure a seamless experience for users regardless of their chosen platform. Performance testing is conducted to assess the website's speed and responsiveness, particularly when dealing with large datasets or complex geospatial functionalities.

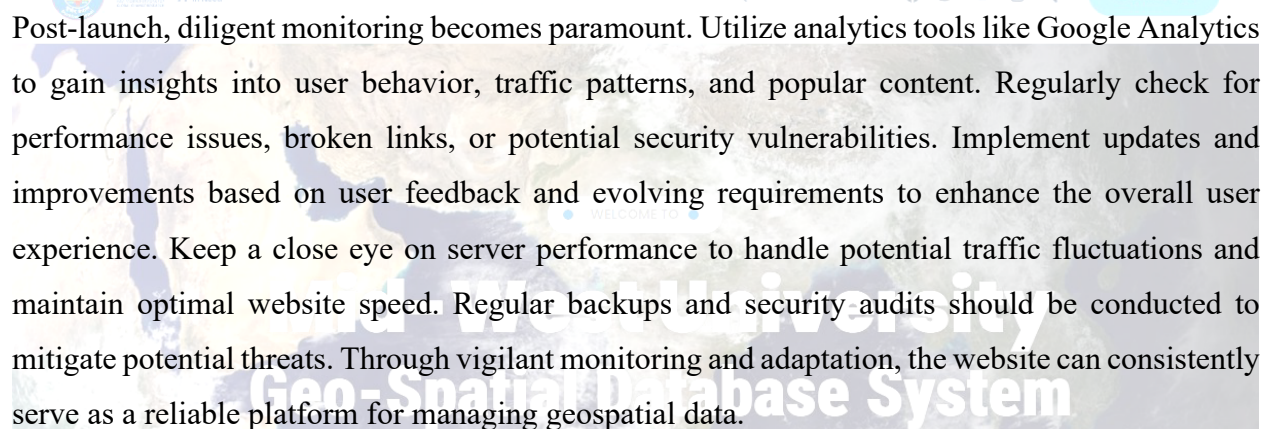
Security is a top priority during testing. Developers examine the website for vulnerabilities, test the effectiveness of encryption measures, and verify user authentication and authorization protocols to fortify the website against potential threats.

User acceptance testing (UAT) involves soliciting feedback from users or stakeholders to ensure the website meets their expectations and remains user-friendly. This iterative testing process

allows developers to identify and address any issues promptly, ensuring the WordPress website is reliable, secure, and performs optimally.

## 10. Launching the website and monitor in future:

Launching and monitoring a geo-database management website on WordPress involves strategic planning and ongoing evaluation for a successful online presence. Prior to launch, a thorough review of content, design, and functionalities, ensuring a seamless user experience across different devices and browsers will be conducted.



Post-launch, diligent monitoring becomes paramount. Utilize analytics tools like Google Analytics to gain insights into user behavior, traffic patterns, and popular content. Regularly check for performance issues, broken links, or potential security vulnerabilities. Implement updates and improvements based on user feedback and evolving requirements to enhance the overall user experience. Keep a close eye on server performance to handle potential traffic fluctuations and maintain optimal website speed. Regular backups and security audits should be conducted to mitigate potential threats. Through vigilant monitoring and adaptation, the website can consistently serve as a reliable platform for managing geospatial data.

## 11. Security Measures:

Securing a WordPress website involves implementing various measures to fortify its defenses against potential vulnerabilities. Firstly, the website will have been regularly updated to the latest WordPress version, ensuring that critical security patches and enhancements have been applied. Robust, unique passwords for user accounts will have been enforced, bolstering access controls and reducing susceptibility to unauthorized intrusions. Additionally, a reliable security plugin will have been installed and configured to monitor and actively protect against potential threats.

To enhance the website's defense against malicious activities, a firewall will have been implemented, serving as a protective barrier to filter out harmful traffic. Regular security audits and scans will have been conducted to identify and address any emerging vulnerabilities promptly. In the event of unforeseen incidents, a comprehensive backup system will have been established, allowing for the rapid restoration of the website to a secure state. Lastly, secure socket layer (SSL)



certificates will have been employed to encrypt data transmission, ensuring a secure and private user experience on the website. Through these proactive security measures, the WordPress website will have been fortified against potential risks, providing a resilient digital environment for both administrators and visitors.

## 12. Backup Data

Establishing a reliable data backup process for a WordPress website, particularly one dedicated to geo-database management, is paramount for safeguarding critical information. Firstly, developers must choose the backup frequency, opting for regular intervals such as daily or weekly to minimize potential data loss. Selecting appropriate backup methods, whether through native WordPress functionalities or trusted backup plugins like UpdraftPlus, ensures a comprehensive backup, including both the WordPress database and associated files. Storing backups offsite in platforms like Dropbox or Google Drive adds an extra layer of security, safeguarding against server-related issues. Automating the backup process not only streamlines operations but also reduces the risk of human error. Regularly testing the backup restoration process guarantees its effectiveness, providing confidence in the ability to **recover** data when needed. Monitoring the backup status and implementing versioning further enhances the reliability and flexibility of the backup system. Additionally, it is crucial to regularly review and update the backup strategy, aligning it with the evolving state of the website. This proactive approach ensures that the backup process remains robust and effective, accommodating changes in data volume, website structure, or other modifications. Consideration of a comprehensive disaster recovery plan, outlining the steps for data restoration and website recovery in case of a catastrophic event, adds an extra layer of preparedness. In essence, a meticulous data backup process not only protects against potential data loss but also serves as a fundamental component of responsible website management, providing resilience and security for both administrators and users.

## SCREENSHOTS OF THE GEOSPATIAL DATA MANAGEMENT WEB PORTAL

APN People In Need

HOME DATASETS DATA EXPLORER ABOUT FAQ

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WELCOME TO

# Mid-West University Geo-Spatial Database System

Mid-West University is seeking to enhance its technological infrastructure by implementing a Rational Database Management System (RDBMS) that integrates seamlessly with Geographic Information System (GIS), Remote Sensing, and Geo-Portal technologies.

EXPLORE DATA ABOUT US

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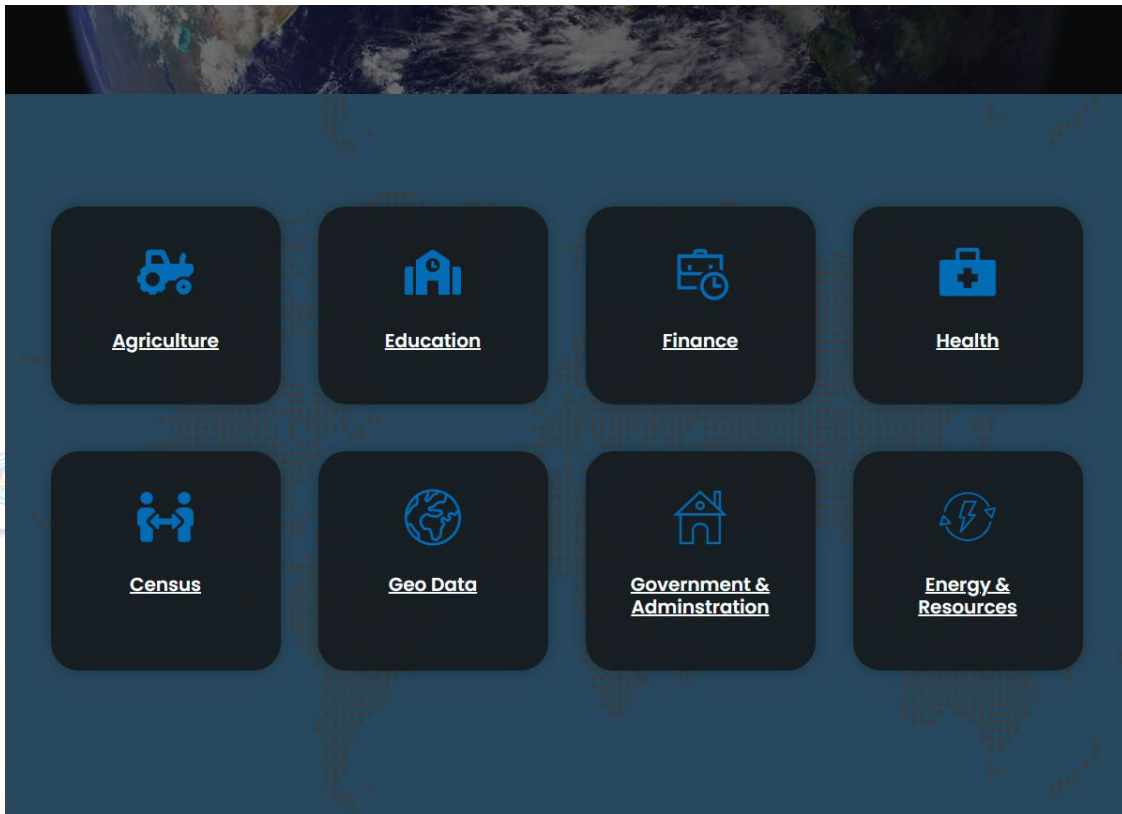
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

## Data Categories

Agriculture Education Finance Health



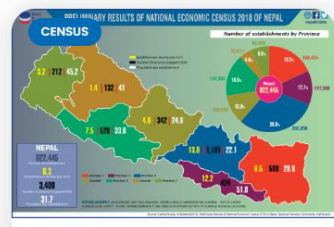
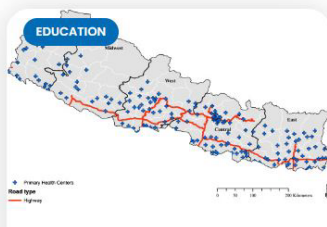
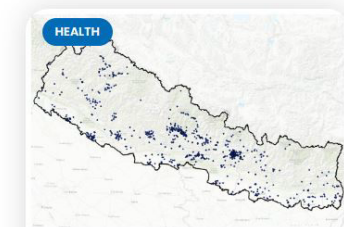


# Geo-Spatial Database System




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## Blog

### Search Data



Name \*







First

Last

Numbers

Email \*

[Submit](#)

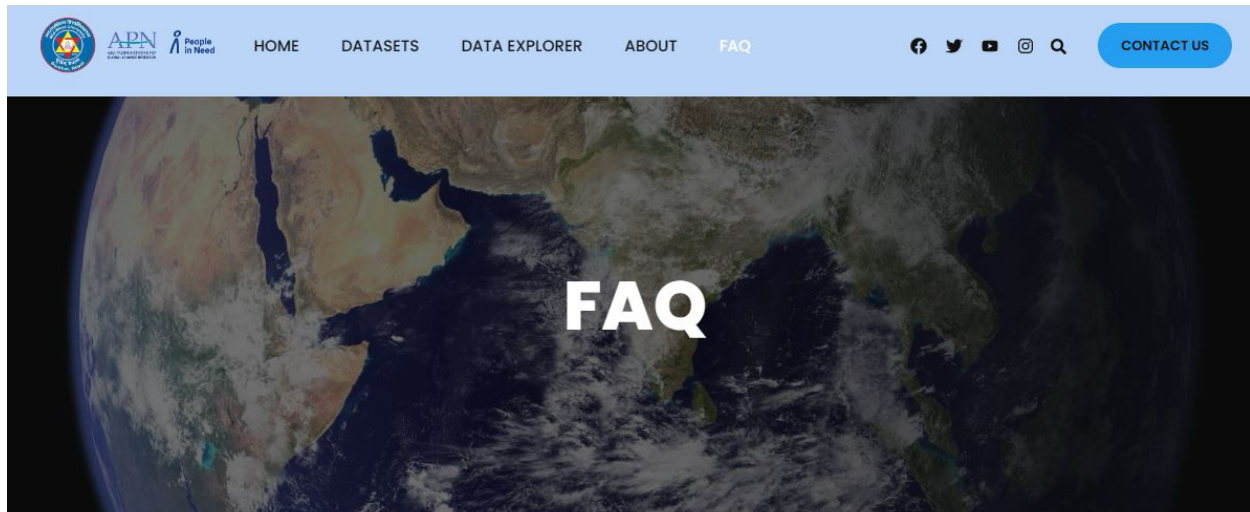
 <p>Mid-West University is seeking to enhance its technological infrastructure by implementing a Rational Database Management System (RDBMS).</p>	<p><b>Useful Links</b></p> <ul style="list-style-type: none"> <li><a href="#">About us</a></li> <li><a href="#">Careers</a></li> <li><a href="#">News &amp; Articles</a></li> <li><a href="#">Legal Notice</a></li> </ul>	<p><b>Support</b></p> <ul style="list-style-type: none"> <li><a href="#">Help Center</a></li> <li><a href="#">Contact Us</a></li> <li><a href="#">FAQ</a></li> <li><a href="#">Parent Community</a></li> </ul>	<p><b>Contact Information</b></p> <p>Feel free to contact &amp; reach us !!</p> <ul style="list-style-type: none"> <li> Birendranagar - 09 Surkhet, Nepal</li> <li> +977 123 456 789</li> <li> midwestuni@email.com</li> </ul>
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The hydropower potential in the upper Indus basin under historical hydro-climatology was prepared using the Hydropower Potential Exploration (HyPE) model. Under historical hydro-climatology, the HyPE model was run to explore theoretical potential followed by technical, financial and sustainable potential under two types of hydropower development policy scenarios. The energy focus scenarios (Large/Medium/Mixed) explored the impact of different scales of hydropower





## frequently asked questions (FAQs)

### What is GIS, and why is it important?

GIS, or Geographic Information Systems, is a technology that captures, analyzes, and visualizes spatial data. It is crucial for understanding patterns, making informed decisions, and solving complex problems related to geography. GIS integrates various data types, such as maps, satellite imagery, and demographic information, to provide a comprehensive view of geographic relationships.

Mid-West University is seeking to enhance its technological infrastructure by implementing a Relational Database Management System (RDBMS) that integrates seamlessly with Geographic Information System (GIS), Remote Sensing, and Geo-Portal technologies.

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