## Plan Overview

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*A Data Management Plan created using HKUL DMPTool*

**DMP ID:** 154/2020

**Title:** Design of sustainable drainage systems (SuDS) in hilly areas of Hong Kong

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**Principal Investigator:** May Ting Fong Chui

**Data Manager:** Boji CHEN

**Funder:** Environment and Conservation Fund

**Grant:** 154/2020

**Template:** HKU Template

**Project abstract:**

Sustainable drainage systems (SuDS) manage stormwater by enhancing infiltration into the ground, and have been implemented in urban areas worldwide to provide environmental benefits such as flood mitigation and water pollution reduction. Currently, SuDS are not widely feasible in areas with steep slopes, since faster runoff speeds in these areas inhibit infiltration. In addition, any enhanced infiltration in steep areas may increase the risk of soil erosion and landslides. In Hong Kong, flatter areas only account for a small portion of its total area, and they are often highly developed, with limited space remaining for the implementation of SuDS. These regions also tend to have shallow groundwater, which is unfavorable for stormwater infiltration. These unique conditions create a strong need for the design of SuDS that can function in Hong Kong's steep slopes, but do not increase the risk of soil erosion and landslides.

In this study, we utilize laboratory experiments and numerical models to characterize the performance of SuDS and their geological impact in areas of steep slopes. The findings and recommendations from this study can serve as the basis for governmental officials and engineers to establish design guidance for SuDS in Hong Kong.

**Start date:** 09-01-2020

**End date:** 09-01-2024

**Last modified:** 06-29-2024

**Copyright information:**

# Design of sustainable drainage systems (SuDS) in hilly areas of Hong Kong

## Data Collection

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### What data will you collect or create?

- Laboratory Experiment Data:

Soil Properties: Measurements such as soil texture, porosity, hydraulic conductivity, and infiltration rates are crucial for understanding how water moves through the soil.
Water Flow Data: Quantify water flow rates, volumes, and characteristics under different soil and drainage system conditions.

- Simulated Results:

Output from simulations can include various scenarios of rainfall, land use patterns, and SuDS designs. This data helps assess the effectiveness of different drainage strategies in hilly terrain.
Geospatial Data:

- Monitoring Data:

Maps of the study area, including topography, land use, and existing drainage infrastructure, are essential for context and spatial analysis.
Climate and Rainfall Data:

Historical and projected rainfall data are critical for designing drainage systems that can handle varying precipitation intensities and patterns.

Real-time or periodic monitoring data from installed SuDS, such as water levels, quality, and system performance metrics, provide feedback on their operational effectiveness.

### How will the data be collected or created?

- Laboratory Experiments:

Soil Properties: Conduct soil sampling at various locations within the study area. Analyze samples in the laboratory to determine soil texture, porosity, hydraulic conductivity, and infiltration rates using standard methods such as soil sieving, hydrometer analysis, and permeameter tests.
Water Flow: Set up experimental setups to simulate water flow through different soil types under controlled conditions. Measure flow rates and characteristics using flow meters and data loggers.

- Simulations:

Use hydrological and hydraulic modeling software (e.g., SWMM, Modflow) to simulate rainfall-runoff processes, drainage system performance, and water quality impacts. Input data should include rainfall data, soil properties, topography, and land use maps.

- Field Measurements:

Deploy field instruments to monitor real-time water levels, flow rates, and quality parameters in existing drainage channels or at specific SuDS sites. This could involve automatic sensors and manual measurements.

## Documentation and Metadata

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### What documentation and metadata will accompany the data?

- Data Description:

Title and Description: Clearly describe the dataset, including its purpose, scope, and relevance to the study on SuDS.
Authors and Contributors: List the names, affiliations, and roles of individuals involved in data collection, analysis, and interpretation.

- Data Collection Methods:

Document detailed procedures and protocols used to collect each type of data (e.g., laboratory experiments, simulations, field measurements). Include information on equipment used, sampling techniques, and any adjustments made during data collection.

- Data Format and Structure:

Specify the file formats (e.g., CSV, GeoTIFF, NetCDF) and structure (e.g., data tables, raster layers) of the datasets. Provide information on data encoding, compression, and any transformations applied.

## Ethics and Legal Compliance

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### How will you manage any ethical issues?

- Informed Consent:

Ensure that all participants in surveys, interviews, or field studies provide informed consent. Clearly

explain the purpose of the research, potential risks, benefits, and how their data will be used.

- Confidentiality and Anonymity:

Safeguard the privacy and confidentiality of individuals and sensitive information collected during the study. Use anonymization techniques if necessary to protect participants' identities.

- Data Security:

Implement secure data management practices to prevent unauthorized access, loss, or misuse of research data. Use encryption for sensitive data and store information on secure servers or platforms.

### How will you manage copyright and Intellectual Property Rights (IP/IPR) issues?

In this research project on the design of sustainable drainage systems (SuDS) in hilly areas of Hong Kong, we will manage copyright and IP/IPR issues as follows:

- Ownership and Rights Management:

Intellectual property rights related to research outputs, including data collected, simulations, and design models, will be jointly owned by [Name of Institution/Project Team]. Ownership rights will be determined and documented in a project agreement signed by all participating stakeholders.

- Permissions and Licensing:

We will obtain necessary permissions and licenses for using copyrighted materials such as GIS maps, software, and satellite imagery. Permissions will be sought from relevant copyright holders, and any associated conditions or restrictions will be adhered to strictly.

- Attribution and Compliance:

All sources of copyrighted materials used in our research will be appropriately attributed in accordance with the terms of use specified by the copyright holders. Proper citation practices will be followed in publications and presentations to acknowledge the contributions of third-party materials.

## Storage and Backup

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### How will the data be stored and backed up during the research? i. e. until stored in the final location (e.g. on your password protected laptop)?

During the research project on the design of sustainable drainage systems (SuDS) in hilly areas of Hong Kong, we will implement robust procedures for data storage and backup to ensure data

integrity and security until it is stored in the final location (e.g., secured in our institutional repository). Our approach includes:

- Primary Data Storage:

Cloud Storage: Research data, including laboratory experiment results, simulated models, and geospatial datasets, will be stored securely on a cloud-based platform (e.g., Google Drive, Microsoft OneDrive). Cloud storage provides accessibility from multiple locations and facilitates collaboration among project team members.
Local Disk Storage: Data will also be stored on password-protected lab computers dedicated to the project. This ensures quick access for ongoing analysis and reduces latency compared to cloud-based retrieval, especially for large datasets and simulations.

- Data Backup Procedures:

Regular automated backups will be scheduled for data stored on the cloud platform to prevent data loss due to technical failures or accidental deletion. Backup intervals will be defined based on the frequency of data updates and criticality.
Lab computers will have scheduled backups to external hard drives or network-attached storage (NAS) devices. These backups will be encrypted and stored securely in a designated physical location to protect against hardware failures or cybersecurity threats.

## How will you manage access and security?

Ensuring secure access to research data is crucial for maintaining confidentiality, integrity, and availability throughout the project on the design of sustainable drainage systems (SuDS) in hilly areas of Hong Kong. Our approach to managing access and security includes:

- Access Control Policies:

Access to research data will be restricted to authorized personnel directly involved in the project, including researchers, collaborators, and designated support staff. Access permissions will be granted based on roles and responsibilities defined in a data access control policy.

- Authentication Mechanisms:

User authentication will be enforced using strong passwords adhering to institutional password policies. Multi-factor authentication (MFA) will be implemented for accessing sensitive data and cloud-based platforms to mitigate the risk of unauthorized access.

- Data Encryption:

Research data stored in both cloud-based platforms (e.g., Google Drive, Microsoft OneDrive) and local storage (e.g., lab computers) will be encrypted using industry-standard encryption algorithms (e.g., AES-256). Encryption ensures that data remains confidential during transmission and storage.

## Selection and Preservation

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### Which data are of long-term value and should be retained, shared, and/or preserved?

In our research on the design of sustainable drainage systems (SuDS) in hilly areas of Hong Kong, several types of data are identified as having long-term value and should be retained, shared, and/or preserved to support future research, validation, and policy development. These include:

- Experimental Data:

Laboratory Experiment Results: Data from soil analysis, hydraulic conductivity tests, and infiltration measurements are critical for understanding soil behavior and water flow dynamics in hilly terrain. These datasets will be retained in structured formats (e.g., CSV files) and shared with collaborators and peer researchers upon request.

- Simulation Results:

Hydrological and Hydraulic Models: Output from simulations using software such as SWMM (Storm Water Management Model) or Modflow will be preserved in model-specific file formats. These results are essential for validating design scenarios and assessing the effectiveness of SuDS strategies over time.

### What is the long-term preservation plan for the dataset?

The long-term preservation of datasets generated from our research on the design of sustainable drainage systems (SuDS) in hilly areas of Hong Kong is essential to ensure their accessibility, usability, and integrity for future research, validation, and policy development efforts. Our preservation plan includes the following components:

- Selection of Repository:

Research data, including experimental results, simulation outputs, geospatial datasets, and monitoring data, will be deposited in a trusted institutional repository specializing in environmental science and engineering. We will select a repository that complies with international standards for digital preservation and provides mechanisms for data citation and access control.

- Data Format and Documentation:

Prior to deposition, all datasets will be prepared in standardized and widely-used formats suitable for long-term preservation and interoperability (e.g., CSV for tabular data, GeoTIFF for geospatial data, NetCDF for climate data). Comprehensive documentation, including metadata describing data sources, methodologies, and quality assurance procedures, will accompany each dataset to facilitate data discovery and reuse.

## Data Sharing

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### How will you share the data?

We will utilize a reputable cloud storage platform, such as Google Drive or Microsoft OneDrive, to host and manage research datasets securely. These platforms offer robust data management capabilities, version control, and access management features essential for sharing data with collaborators and stakeholders.

### Are any restrictions on data sharing? If yes, Why?

- Intellectual Property Rights (IPR):

Third-Party Copyrighted Materials: Datasets incorporating copyrighted materials (e.g., maps, images, software) obtained from third parties will be shared only if permission or licenses explicitly allow for such sharing. Restrictions on data sharing are necessary to respect intellectual property rights and adhere to licensing agreements.

- Confidentiality Agreements:

Non-Disclosure Agreements (NDAs): Research collaborations involving proprietary data or confidential information covered by NDAs will restrict data sharing to authorized parties listed in the agreement. This restriction ensures compliance with contractual obligations and protects sensitive business or research-related information.

## Responsibilities and Resources

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### Who will be responsible for data management?

In our research project on the design of sustainable drainage systems (SuDS) in hilly areas of Hong Kong, responsibility for data management will be shared between the Principal Investigator (PI), Dr. May Chui, and the designated Data Manager, Boji Chen. The roles and responsibilities are as follows:

Principal Investigator (PI), Dr. May Chui:

Dr. May Chui will oversee and have overall responsibility for the research project, including data management activities. Her responsibilities will include:Data Oversight: Ensuring that all data collected and generated during the project are managed in accordance with ethical guidelines, institutional policies, and funding agency requirements.
Data Quality Assurance: Overseeing data collection, validation, and documentation processes to ensure accuracy, completeness, and integrity of research data.
Compliance: Ensuring compliance with legal and regulatory requirements related to data protection, intellectual property rights, and ethical standards.
Data Access: Authorizing access to research data for project team members, collaborators, and stakeholders based on defined roles and access controls.
Data Manager, Boji Cehn:

Boji Chen will serve as the designated Data Manager responsible for day-to-day data management tasks and operational support. His responsibilities will include:Data Organization: Organizing and structuring research data into standardized formats suitable for analysis, sharing, and long-term preservation.
Data Storage and Backup: Managing data storage systems, including cloud-based platforms and local storage devices, and ensuring regular backups to prevent data loss.
Data Security: Implementing and maintaining data security measures, such as encryption, access controls, and monitoring, to protect against unauthorized access and breaches.
Documentation and Metadata: Creating and maintaining comprehensive documentation and metadata describing datasets, methodologies, and data processing steps.
Data Sharing: Facilitating data sharing activities, including preparing datasets for publication, generating shareable links, and ensuring compliance with data sharing policies and agreements.

## What resources will you require to deliver your plan?

No

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