CONCEPT NOTE 1

Improvement of Stormwater Management System

Stormwater and drainage planning, SOPs and regulations in urban extension area for households, private plots and public settlement area

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April 2024

CONCEPT NOTE 1

1. Project Title

Improvement of Stormwater Management System of Sam Neua Town and Extension Areas

Water Sensitive Area Development Plan Reference: Project 1.1 Stormwater and Drainage Planning

2. Background

Currently there are no standard procedures or building regulations to effectively guide planning and control construction of new households and public spaces in terms of stormwater runoff.

Stormwater management is mainly understood as open drainage along roads and lacks documentation and regular maintenance. Sam Neua has no integrated stormwater management concept which considers the whole catchment area and the enhancement of the natural water balance. At the same time floods and erosion increase. At present, also a monitoring of floods, erosion or efficiency of existing stormwater drainages is not happening.

To effectively manage the increased stormwater runoff resulting from urban expansion (new households and settlement area), the initiative develops strategies that focus on controlling stormwater at the household / plot level and the integration with stormwater system of the broader surrounding public settlement area. The focus is on the development of Standard Operating Procedures (SOPs), guidelines and regulations:

- for public settlement areas (e.g. roadside drainage, community drainage, natural drainage)
- $\circ~$ for construction permits of new households and other private plots/ buildings
- integration of household stormwater systems with broader village / settlement infrastructure and overall stormwater management system

This Concept Note outlines the general strategies as well as implementation. **3. Purpose and Objectives**

The primary objective is to increase the efficiency of existing Stormwater Management System (SMS) and to develop it towards an integrated water sensitive SMS with the objective to avoid flood damages and reduce risks for health and safety and at the same time serving the vision for Sam Neua of a "Green, Clean and Beautiful town".

This involves creating a framework that manages stormwater at its source (household level) and also ensures its integration into the broader village or settlement area's drainage infrastructure (grey infrastructure and natural drainage).

An additional objective is to implement standard procedures for regular maintenance, condition assessment and repair according to the needs for stormwater management systems, which include the definition of responsibilities, activities, communication, and involvement of stakeholders. This will reduce costs due to the extent of asset-lifecycle.

In order to estimate the natural water cycle in the future, new approaches must be taken in the field of rainwater management. Sam Neua needs innovative measures that simultaneously ensure flood protection for the city, as well as the protection of groundwater and surface water. Decentralized concepts with which rainwater is collected where it falls and - as far as possible - is reused directly or returned to the natural water cycle on site using suitable systems are therefore of central importance.

The integrated SMS follows principles to enhance the local and natural water cycle and reduce the discharge towards the river.

By moving towards a natural water balance, we create sustainable water management and thus preserve urban habitats by providing sufficient local water of good quality. The water balance is characterized by the ratio infiltration, evaporation and surface runoff.

The implementation of Standard Operation Procedures (SOP) for Sam Neua Town aims for:

- Cross sectoral planning and communication of integrated stormwater management, with its elements WSUD and principle of natural water cycle
- Regulations for Strategic and Scheduled Maintenance
- Documentation of assets and their condition
- Clarification and definition of procedures and responsibilities
- Follow Sam Neua's Vision and monitor indicators

4. Project Strategy

1. Development and Implementation of SOPs, Guidelines and Regulations:

Involves the <u>development and implementation</u> of Standard Operating Procedures (SOPs), standards, and regulations at both the household and village / public space levels.

1.0 SOPs for stormwater systems describes procedures and responsibilities for how to implement WSUD, ensuring that stormwater is managed effectively at its origin, thereby reducing the load on main drainage systems. This includes specific requirements for construction permits that mandate the incorporation of stormwater management solutions. These may WSUD principles / NbS including: On-site detention systems, Rainwater harvesting systems, Permeable paving materials, Infiltration space, Rain gardens, Etc.

1.1 Requirements for public areas such as roads and places

1.2 Requirements on Household Level Management

2. SOPs and regulations for Operation and Maintenance (OM) of these systems

3. Standards for design, materials, construction methods

4. Policy framework for integrating individual systems into the broader municipal drainage network

2.Implementation in one example site integrating Village Scale / Public Area:

The project will also focus on the implementation in two example areas (described in the Annex) including of household-level stormwater management into the larger village or settlement drainage systems. These may follow WSUD principles / NbS for designing and implementing, for example:



| Roadside infiltrati | on | | | | | |
|--|---|--|--|--|--|--|
| Larger-scale determine | ntion basins, infiltration | | | | | |
| Parks and other green spaces | | | | | | |
| Community gardens | | | | | | |
| Upgrading existing stormwater infrastructure to handle increased loads | | | | | | |
| | | | | | | |
| 3. Encourage Stakeholder Engagement and Capacity Building: Training programs and awareness campaigns to engage and build capacity and ensure compliance with the established SOPs, standards, and regulations. | | | | | | |
| 5. Project Description | Task and Steps | | | | | |
| The implementation task | s and steps are described for the two following implementation | | | | | |
| areas. | | | | | | |
| lask | Steps | | | | | |
| 1. Introduction of | 1. Identify responsibilities according to drafted SOP | | | | | |
| SOP for | 2. Inauguration of SOP | | | | | |
| Operation and | 3. Introduction and Implementation of Documents | | | | | |
| Waintenance | according to SOP (Maintenance Strategies + | | | | | |
| | Create decumentation and map of existing SMS | | | | | |
| | 4. Create documentation and map of existing SWS | | | | | |
| | 5. Engage with local stakeholders infough consultations | | | | | |
| | to gather input and build support. | | | | | |
| 2. Introduction of | 1. Identify responsibilities according to drafted SOP | | | | | |
| SOP for | 2. Inauguration of SOP | | | | | |
| Improvement of | 3. Introduction and Implementation | | | | | |
| Stormwater | 4. Engage with local stakeholders through consultations | | | | | |
| Management | to gather input and build support. | | | | | |
| System | | | | | | |
| 3. Implementation of | 1. Community awareness | | | | | |
| Nature-based | 2. Meeting with stakeholders, i.e. School SOS | | | | | |
| Solution at SOS | 3. Design of planned measures | | | | | |
| Junction | 200m Infiltration trenches 20m² rain gorden at SOS aphael | | | | | |
| | 30m² rain garden at 505 school 260m raingerden esseede including 100 m | | | | | |
| | - 200m raingaruen cascaue including 100 m hillside protection | | | | | |
| | 4 Develop proposal and start tendering process | | | | | |
| | 5 Contract and Construction | | | | | |
| | 6. Inauguration period | | | | | |
| | | | | | | |
| 4. Implementation of | 1. Meeting with village members and property | | | | | |
| hillside protection | owner | | | | | |
| near SOS Junction | 2. Clarification of responsibilities | | | | | |
| | 3. Design of planned measures | | | | | |
| | \circ 50 m of hillside wall (ca. 2m) and | | | | | |
| | improvement of existing drainage | | | | | |
| | 4. Preparation of work order and budget | | | | | |
| | 5. Develop proposal and start tendering process | | | | | |



| | | | 6. Contract and Construction | | | | | | |
|--|-------|------|--|---|---|----------|--------------------------|---|---|
| 5. Training and Capacity Development | | | Implementation of SOP, roles responsibilities and activities Planning and Design of Nature based solution | | | | | | |
| | | | | | | | | | |
| 6. Implementation Plan | | | | | | | | | |
| Implementatio n SOP | X | X | x | x | × | | x | x | |
| Community Awareness | X | | | | | | | X | |
| Design and planning | | x | x | | | | | | |
| Tendering | | | | X | | | | | |
| Process | | | | | | | | | 4 |
| Construction | | | | | X | | X | | 4 |
| nauguration | | | | | | | X | X | |
| District: UDAA, OPWT Villages: Na Ban Administration, Na Ban communities | | | | | | | | | |
| 8. Budget (not p | ublis | hed) | | | | | | | |
| 9. Monitoring & Evaluation | | | | | | | | | |
| Responsibility for monitoring | | | | | | | | | |
| Through implementation of the SOP, the indicators in the SOP have to be monitored. Therefore, a documentation of the current and the future status is required. An efficient data management for collaboration between departments should be installed. | | | | | | | onitored. n efficient | | |
| Indicators relevant for new development could be: | | | | | | | | | |
| Construct new WSUD drainage (NbS): 100m / yr. Increase green space and infiltration at household level: 20 households/year Streets with 20 % green and trees: 2 per year (The Vision of Sam Neua: Green, clean and beautiful Sam Neua) Keeping rainfall in the smaller area where it falls up to 70% (30% should flow to the riverways) | | | | | | | | | |
| Vision Sam Neua: Green, clean and beautiful - Indicators relevant for new development To measure if the Maintenance Schedule is implemented | | | | | | elopment | | | |



| Annual maintenance including cleaning, repairing, and upgrading of 1 kilometer of the system. | | | | | | | | |
|--|---|--|--|--|--|--|--|--|
| Community cleaning sessions once a month in the village area. | | | | | | | | |
| To measure quality of documentation: | | | | | | | | |
| Number of assets which are documented in GIS (map of drainage, SMS infrastructure) | | | | | | | | |
| 10. Risks / Challenges | | | | | | | | |
| Drainage is used as route for water pipe | High risk of pollution of water through leakage Risk of damage during cleaning work | | | | | | | |
| Drainage is polluted with wastewater | High risk of health, sickness Pollution of groundwater | | | | | | | |
| Drainage is filled up with sand and waste | High risk of hygiene situation Risk of flood Risk of further erosion | | | | | | | |
| 4. Erosion along roads | High safety risk Risk of blocking drainage | | | | | | | |
| 5. Reported floods and damages (xx) | High safety risk through damages of construction High health risk though mixture with wastewater Risk of un accessibility | | | | | | | |
| 12. Annex | | | | | | | | |
| Annex 1: Implementation Example at SOS Junction (attached) | | | | | | | | |

Annex 1: Implementation Example at SOS Junction

1. Project Title

1. **Improvement of Stormwater Situation** at SOS School Road Junction, Naliew Village

2. Background

The neighborhood at SOS School in Naliew Village is facing persistent flooding and severe water pollution issues. The neighborhood in this area is on sloping terrain. Especially during rainy season, considerable amounts of stormwater are washed downhill along the roads. The roads have an open drainage but some of the houses and infrastructure were built are not stabilized against erosion.

Analysis reveals multiple causes: erosion from nearby slopes clogging the drainage system, which is not adequately maintained, and poor overall infrastructure. Frequent flooding is exacerbated by wastewater being discharged into the same open drains used for the drinking water pipes.



Plot A without any protection

> Neighbouring plot B has at least a stonewall but still no proper <u>protection</u>

Measures to retain surface runoff on private ground



3. Purpose and Objective

An integrated strategy combining physical infrastructure improvements and management reforms is advised. To prevent soil erosion into the drains, private properties along the drainage lines should install barriers. Property owners could also modify land gradients or implement rainwater retention methods.

The objective is a comprehensive water-sensitive solution for effective stormwater water management which will target aspects of maintenance and implementation of measures for erosion protection and reduction of flood situation, the health risk and increase the stay of living.

4. Project Strategy

1. Introduction of SOP for Maintenance of drainage system

Regular maintenance of the drainage system is essential, including cleaning, removing debris, and repairing any damage. The tasks and duties of the local government, the communities and the household for the management of these infrastructural services mut be defined and implemented in a binding manner.

The implementation of the SOP (standard operation procedure) can be practised along this example.

To organise the maintenance and for further planning it is important to have a good documentation of the existing drainage and green-blue infrastructure.

Documenting the existing drainage network and all relevant stormwater infrastructure is crucial for effective planning. Mapping the flow directions will aid in designing retention basins, infiltration trenches, or redirected flow paths.

2. Implementation of hillside protection

The area or plots should have a proper protection along the street and the drainage. Additionally, the owners may be encouraged to improve the inclination or to implement simple measures to retain the rainwater.





Conclusion: Construction of protection wall and improvement of existing drainage about 50 m.

3. Improvement of Stormwater Management System

There are two main measures to improve the situation of flood at this corner. Improvement of the drainage to protect against flash flood. And in addition to implement green-blue infrastructure. This will reduce the peak run off, less rainwater runs in direction to the river and the natural water balance will be improved.



3.1. Implementation of nature based solutions along roads

The roads leading towards the junction needs to be provided with a better system to collection, detention and infiltration of rainwater. Therefore, a combination of nature based solutions as bioswales, infiltration trenches along the roads are suggested. This will respond towards the Indicator and Sam Neua Vision of 20% of road area to be green.

The road downhill has one existing drainage

The road has a slight inclination towards the other side. Here would be a good option to implement an infiltration trench





Potential area = around 320 m^2 , which is around 20% of the paved area







Potential sites 1-4





From the whole length of the road we selected suitable parts as potential to implement Infiltration trenches which is more than enough to detain the rainwater falling in this area. The existing drainage on the other side of the road gives additional protection in case of heavy rainfall.

Assumption:

Solution 1: Simple Infiltration trench along streets

- With Failure frequency n=0.2 and medium infiltration capacity the area requirement is 15-20% of the connected paved area.
- > Design: depth 30 cm, slope ratio: ca. 1:2, width
- Infiltration capacity: assumption low-medium (if the infiltration capacity of the soil is to too low, packages of gravel have to be considered)

Area needed: $1600 \times 15\% = 240 \text{ m}^2$

Conclusion: Suggested length of infiltration trenches 0,5 - 1,5 m width: 200 m

3.2. Construction of an on-site infiltration system (raingarden) on the school grounds

The school ground is the deepest point at the junction and flooded during rainfall. It is suggested to implement a green retention area on the school ground as a raingarden, infiltration trenches. It can be combined with a playground or sitting area. Especially when there are more trees along the roads this area will be more attractive.



Conclusion: Suggested area of raingarden 3 m * 10 m: 30 m²

3.3. Construction of cascade raingarden along the planned road downhill towards the river

The Municipality is thinking of a road construction downhill starting from the junction in direction to the river. Flash flood is currently running downhill and should be controlled in a water way along the road.

The hillside must be protected through a wall as described above. The existing wall in the upper 160 m may need improvement.





Planned road from Junction SOS at SOS School downhill towards the river.

To reduce the flow the waterway should be constructed as raingarden cascade.







Conclusion: Estimated length of raingarden cascade 0,5 m width: 260 m including hillside protection about 100 m and wall improvement about 160 m.

8. Expected Outcomes

Enhancing the green spaces as retention areas and the introduction of trees, possibly integrated within schoolyard, a playground or sitting area, would make these spaces more attractive and contribute to the overall liveability of the area.