

TA – 7984 NEP

February 2014

**Mainstreaming Climate Change Risk Management in Development**

**1 Main Consultancy Package (44768-012)**

**RIVER SAND MINING - CHITWAN DISTRICT CASE STUDY**

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| Prepared for | Ministry of Science, Technology and Environment, Government of Nepal |
|  | Environment Natural Resources and Agriculture Department, South Asia Department, Asian Development Bank |
| Version | A (Final) |

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# Sand mining activities in the district

## District sector master plan

The Chitwan district has no master plan in sand mining sector. The location of the sand mines and the volume of extractable sand vary each year, depending on the sediment load in the rivers and velocity of flow at different river sections. Depending on the approximate location of the sand deposit and the volume of extractable sands-gravel-stone (SGS), as mentioned in the IEE report, the DDC calls for bid, and contracts with the highest bidder to extract SGS materials.

The Chitwan district has prepared a map of the Regional Strategic Plan for the year 2011-12 (DDP-DDC-Chitwan), given below.

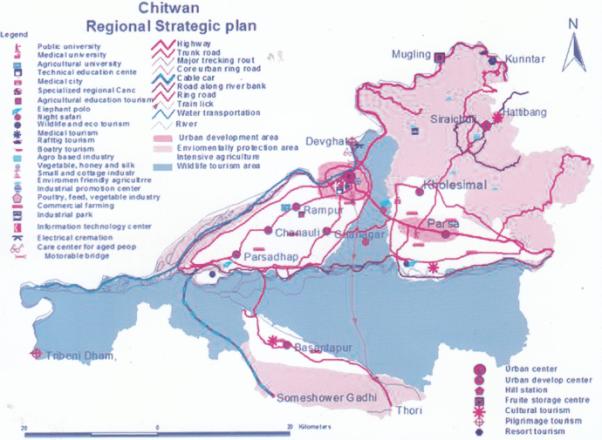


Figure 1: Chitwan Regional Strategic Plan 2001-12

## Sector budgeting and staffing

No specific budget is allocated for this sector. The budget related to river training, watershed management, embankment and river bank erosion protection, which are indirectly related to sand mining, are kept under the activities of DWIDP Division Office Number 3.

As per the Local Self Governance Act 1999, the District Development Committee (DDC) is responsible for the monitoring of sand mining activities in the district. The Chitwan DDC has not assigned anyone specifically to monitor the sand mining activities. A committee is formed annually for awarding sand mining contract; however this committee does not have any responsible for monitoring sand mining activities after the contract has been awarded.

## Location of sand mining activities

The locations of the sand mining sites change annually, depending on the locations of sediment deposition. The location of the sand mining sites in the Chitwan district for the year 2012-13 is shown in the figure; the approximate sand mining locations are indicated by the red dots.

Figure 2: Location of san mines in Chitwan district

## Sector trends and issues

The contractors are syndicating the annual DDC sand mining contract process, by refusing to submit the bid, and preventing others from submitting bids, unless the volume of extractable sand-gravel-stone (SGS) volume, as reported in the IEE Report, is reduced to their satisfaction, challenging the accuracy and authenticity of the data in the IEE Report.

The establishment of the Chitwan National Park in Chitwan District is hampering the extraction of SGS materials from the river banks and river beds, even when the DDC issues permit to the contractors. This process reduces the annual revenue of the DDC and forces the DDC to spend its own fund to extract the SGS materials to prevent riparian settlements being inundated in the flood season.

The local level units of the government, VDC, and the local clubs are demanding higher share of the sand mining revenue from the DDC, issuing their own permit, and demanding additional tax from the transporters of the SGS materials, thus reducing the attractiveness of the SGS contract process.

The annual revenue from the SGS contracts in Chitwan District is increasing at an exponential rate, at least in the last few years. Given the high climate variability, the potential effects of the climate change, and rampant and unmanaged developmental activities in the VDCs, the soil erosion rate is expected to increase, which in turn, will increase the available extractable volume of SGS materials in the rivers of Chitwan District, at least for some years to come.

The Chitwan DDC is attempting to manage sand deposition in river beds, and consequent rise in river bed elevation, by implementing various adaptation measures like (a) embankment construction, (b) river training, (c) bio engineering, (d) watershed management, (e) community forest and (f) sand mining. The adaptation measures are implemented jointly with different line agencies and non-governmental organizations in the district. For example, the embankment construction and other river training works are conducted in collaboration with the Division Office Number 3 of the DWIDP, the bio engineering and watershed management works are conducted in collaboration with the DSCWM and the community forest works are carried out in collaborated with the DFO.

## Past extremes in the district

The past extreme events related to climate variability are the flood of 1993 and 2003 which resulted in major damages to different infrastructures of Chitwan district.

Records associated with past extremes in sand mining sector are not available. The data on the rate of river bed aggradation and the volume of sediment deposit in the river banks are not recorded anywhere, and in since the sediment deposition in the river bed was not a major concern of anyone in the past, people did not notice of any past extremes. The allowable volume of extracting river bed materials in the sand mining contract is determined based on the total volume of extractable materials on each river stated on the Initial Environmental Examination (IEE) report of the district. However since IEE has been introduced recently, the past extremes have not been recorded.

Deforestation and the unmanaged developmental activities in the Chure and Bhabar regions of Chitwan district in the recent years indicate a potential of rapid increase in sediment load in the rivers. The rate of increase in the sediment deposit in the river beds of Chitwan district can be indirectly and roughly estimated by the rate of increase in the volume of extractable SGS materials, as reported in the IEE documents.

The following tables provide the records of the past events of flood and landslides in Chitwan District which are related to the fluvial sedimentation rate, and as such deposits of sand in the rivers bed and sand mining.

Table 1: Landslide events



Table 2: Flood events



Based on different factors associated with the climate change, the Ministry of Environment in 2010 has classified the Chitwan district to be highly vulnerable, with a vulnerability score of 0.601 to 0.768 (NAPA, 2010).

## Linkages to other sectors

Many roads and bridges are planned to be built across different rivers and rivulets in Chitwan district in the near future. Deposition of the Sand-Gravel-Stone (SGS) materials can elevate river bed level, which will impact the high flood level, which is one of the primary parameters in the design of bridge, road alignment and weir.

The increased deposition of SGS materials in the river bed can affect the elevation of the intake level designed for water supply schemes.

The plinth level of the houses built in riparian area need to be further elevated since more water can be diverted to the settlement during a flood season due to elevation of river bed resulting from sand deposition. The plinth level of the toilet, hand pumps, and sock pit built in riparian area also need to be on higher ground to avoid flooded in a raining season.

The flood control and river training structures like the embankment, dykes and spurs need to be designed with the potential impact of rise in river bed elevation. The deposition of sediment in one bank of a river can result in diversion of river flow in another bank in the next flood season, unless the deposited sediment is balanced by extraction or natural scouring. As such, sand mining is sector is interlinked with the river bank protection activities.

# Review of impacts of sand mining in the district

## Affected infrastructure

There is no specific infrastructure/asset in Chitwan district specifically related to sand mining sector. The private and public buildings and structures built close to the river banks, and in some cases built by encroaching river banks, can be considered as assets, which will be covered in other sectoral studies. For example, the roads and bridges built along and across the rivers will be covered in the road and bridge sector study. The structures associated with irrigation and water supply will be covered in their respective sectoral studies. The built river training structures, like the embankment, spurs, dykes, and gabion walls can be considered as assets associated with sand mining. But again, these specific structures will be covered under the river training and water induced disaster management (DWIDP) sectoral study.

Removable properties such as the excavators, shovels, picks, etc owned and used by the sand mining contractors can be considered as assets. But there is no proper record of such individually owned assets.

### Prioritisation process

The following is the prioritization process of plans and programs in the Chitwan district. The proposed plan/program is assessed under the following indicators (DDP, F.Y. 2012/13, Chitwan DDC).

|  |  |
| --- | --- |
| 1. | Provides immediate, direct benefit to the people, with employment/income generation |
| 2. | Assists enhancement of agricultural production |
| 3. | Implementable with local resources, skills and capability |
| 4. | Assists in environment protection |
| 5. | Uplifts backward and marginalized indigenous people |
| 6. | Uplifts disabled, women and children |
| 7. | Benefits greater area and higher number of population |
| 8. | Provides higher return on lower investment |
| 9. | Multipurpose projects |
| 10. | Higher proportion of public participation |
| 11. | Operation, management and sustenance from local level |
| 12. | Potential for economic and technical resources |
| 13. | Supports institutional development and self governance |
| 14. | Promotes traditional skill and cultures |

Numerical weight of for each indicator used in assessing priority of plan/project:

|  |  |
| --- | --- |
| Description | Weight |
| Very good impact on the indicator | 5 |
| Good impact on the indicator | 4 |
| Medium impact | 3 |
| Low Impact | 2 |
| Negligible Impact | 1 |

### Priority infrastructures

There is no infrastructure in Chitwan district specifically related to sand mining sector. All the major infrastructures constructed along and across the rivers, like the road, bridges, water supply plant head works, irrigation project head works, sewerage lines, embankments, dykes, spurs, and other river training and river bank protection works etc. are the priority physical infrastructures of the district indirectly associated with the sand mining sector. The energy and communication infrastructures like the distribution stations/substations and transmission lines of Nepal Electricity Authority, relay station and the communication towers of Nepal Telecom are the priority infrastructures of Chitwan district.

The following are examples of the priority infrastructures of Chitwan district.

1. Narayanghat-Mugling Highway, including the bridges in the highway
2. Part of the East-West Highway and the bridges in the highway
3. Khageri Irrigation Project
4. Suspension bridge of Devighat at Bachhyauli
5. Highway to Shaktikhor and Dahakhani
6. Suspension bridge at the boarder of Birendranagar and Korak
7. As per the District Development Plan 2012-13, the following bridges are under priority.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| S. N. | Bridge Name | River | Ward No. | |
| **Right Bank** | **Left Bank** |
| 1 | Dhikuwaghat S. B. | Khageti Khola | R. N. P. 6 | R. N. P.7 |
| 2 | Bansi | Kayar Khola | R. N. P. 3 | R. N. P. 3 |
| 3 | Kayar Khola | Kayar Khola | Shaktikhor 7 and 8 | Shaktikhor 8 |
| 4 | Thakaltar S. B. | Lothar Khola | Lothar 8 | Lothar 4 |
| 5 | Bharang Khola | Bharang Khola | Kaule 2 | Kaule 3 |
| 6 | Rigdi Nibhara | Rigdi Khola | Kabilas 9 | Dahakhani 6 |
| 7 | Pagarahani Dobhan | Pagarahani Khola | Chandibhanjyang 1 | Chandibhanjyang 1 |
| 8 | Samphyang S. B. | Samphyang Khola | Shaktikhor 2 | Shaktikhor 2 |
| 9 | Lothar Khola | Khaitar Khola | Lothar 4 | Lothar 6 |
| 10 | Ghatte Khola | Ghatte Khola | Dahakhani 1 | Chandibhanjyang 1 |
| 11 | Tantesh Puchhar (Rigdi) | Rigdi Khola | Chandibhanjyang 7 | Chandibhanjyang 2 |
| 12 | Aasha Khola | Aasha Khola | Kaule 8 | Kaule 9 and 6 |
| 13 | Rigdi Khola | Rigdi Khola | Kaule 6 and 7 | Darechowk 9 and 8 |

The following are the photographs of some of the assets of Chitwan district associated with sand mining sector.

|  |  |
| --- | --- |
| C:\Users\profhari\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Word\Ladari Khola bridge.jpg | **Ladari River Bridge**: The foundation of this bridge settled due to various reasons. The location of the bridge is at a right angle bend of the river, the foundation of the bridge is too shallow, and the sand mining was carried out too close to the bridge, thus exposing the foundation of the bridge and compromising the stability of the bridge. |
| C:\Users\profhari\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Word\IMG_8362.jpg | **Lothar Khola Embankment**: Due to rapid rise in the river bed, banning of extraction of sand from the river bed, and consequent flooding in the riparian settlements, the embankment in the left bank of the Lothar river is constructed. |
| F:\Scan Document\Lothar River Dyke_Manahari VDC_DWIDP Bulletin 2010-11.jpg | **Lothar River embankment** (left bank) during construction. The embankment in the right bank was construction several years ago. |
| C:\Users\profhari\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Word\IMG_8356.jpg | **Lothar-Rapti Irrigation Project**: Annual deposition of sand in the upstream side of the river causes shifting of the river flow. By extraction of the sand deposits, a part of the river flow is diverted towards the head works of this irrigation project, annually, to keep the project under operation. |
| C:\Users\profhari\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Word\IMG_8290.jpg | **Ratna Nagar Water Supply Tank**, part of a water supply scheme in Ratna Nagar, established in 2006, serves 10500 households. |
| C:\Users\profhari\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Word\IMG_8253.jpg | C:\Users\profhari\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Word\IMG_8260.jpg |
| **Kayer Khola River Training** works to protect river bank erosion on left bank and right bank. The foreground shows an example of excessive extraction of river bed materials. The river bed materials have been extracted by digging more than 2 meters from the existing (base level) river bed. Such unmanaged sand mining activities result in increased vulnerabilities of structures built along and across the rivers. | |
| F:\Scan Document\Chyatra Khola Birendra VDC Illegal sand extraction method DDP_DDC report_2068-69.jpg | Extraction of sand by using illegal means (excavator) at Chyatra Khola, Birendra VDC, Chitwan (DDP-DDC Report, Chitwan 2011-12) |
| C:\Users\profhari\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Word\Pampa Khola8.jpg | C:\Users\profhari\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Word\Pampa Khola3.jpg |
| **Pampa Khola embankment**, left bank and right bank, at the sand mining site: The settlements are located very close to the river. | |
| C:\Users\profhari\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Word\Sand washing naer Pampa Khola.jpg | Sand washing facility near Pampha Khola, Chitwan. |

## Past adaptation responses

The Chitwan district has prepared District Disaster Management Action Plan, 2004 and Community based Disaster Management Plan of 31 VDCs and 1 Municipality, 2008. Chitwan DDC also allocates budget for disaster risk reduction activities (structural and non-structural). In a bid to minimize the sufferings caused by unexpected floods, the Chitwan district has adopted a ‘Prior Information and Rescue Information Transmission System’. The District Disaster Management Committee implements the system, aiming to warn the people prior to natural disaster and to carry out rescue operation effectively.

The Chitwan DDC has considered sand mining as an adaptation measure against flooding and inundation of riparian and low lying lands in the district. At most of the locations along the rivers, the DDC has been able to maintain river bed elevation by issuing license to mine sand. As such, the success of the adaptation measure is encouraging.

Additionally, different project based adaptation measures at specific locations have been carried out by non-governmental organizations. The following are the examples of such programs and plans in Chitwan District.

1. Local Self Governance Help Program
2. District Energy Development Plan
3. Local Development Fund
4. Women and Children Development Program
5. Rural Reconstruction and Re-establishment Help Program

The DWIDP has carried out several preventive measures to reduce the rate of fluvial sedimentation, and thus to reduce the deposition of sand in the river beds of Chitwan district, with an objective to reduce the water induced disasters in this district. The photographs of some of the adaptation measures taken by the DWIDP follow.

|  |  |
| --- | --- |
| F:\Scan Document\Martal Khola landslide protection_DWIDP Bulletin 2007-8.jpg | Martal Khola landslide protection works (DWIDP Bulletin 2007-8) |
| F:\Scan Document\Sitam Khola Checkdam_Lothar Watershed_DWIDP Bulletin 2010-11.jpg | Sitam Khola Check dam in Lothar River Watershed (DWIDP Bulletin 2010-11) |
| F:\Scan Document\Gugurchi River_Korak VDC_checkdams_DWIDP Bulletin 2010-11.jpg | Check dams to reduce fluvial sedimentation at Gugurchi River, Korak VDC, Chitwan (DWIDP Bulletin 2010-11) |

Due to different anthropogenic activities and natural events, the rate of river bed rise is increasing. The climate change effects can increase the fluvial sedimentation rate and increase rate of river bed aggradation rapidly. Moreover, the additional requirements in sand mining activities by the District Forest Office and in the area within the Chitwan National Park have hindered smooth operation of sand mining activities in the district.

# Recommendations for improved management of sand mining

Some preliminary recommendations to improve the management aspects of the sand mining sector are:

1. Capacity development of the DDC to effectively monitor the sand mining activities in the district. If required, the DDC should team up with the security agencies to provide effective monitoring of the sand mining sites.
2. The local community should be made a part of the monitoring team of sand mining activities.
3. Increase coordination, or formation of a joint commission, between the DDC and DFO for minimizing the misunderstanding on the licensing and revenue collection from the sand mining activities in the district.
4. The deadline to submit the IEE study reports related to the sand mining should be around the end of December, which will provide time to study the reports by the concerned official of the MoFALD.
5. There should be provisions of estimating the amount of extractable sand-gravel-stone from the river bed based on a series of cross sections. The cross sections before and after extraction of the sand from the river bed will provide a means of estimating actual volume of sand extracted from the river bed.
6. The details of the locations of each sand mining should be explicitly mentioned in the IEE report. The exact locations of the SGS mine sites , and the extractable SGS volume from each site should be mentioned in the contract document, with coordinate values and maps.
7. There should be provision of contribution by the sand mining contractor for any expenses related to new needs of river training works resulting from over extraction of sand from the river bed.
8. A fixed portion of the revenue from the sand mining should be earmarked for specific local developmental activities, and the amount should be provided to the local governmental units like the VDC, once the sand mining contractor submits the revenue to the DDC. Specific development plans should be prepared to utilize the fund. This provision can minimize the current disputes between the sand mine contractors and the VDC officials.
9. The river training structures should be designed and constructed by incorporating possible impact of rise in flood level due to climate change. A standard design manual for the same should be prepared and followed.
10. The amount spend to remediate the effects of the excesses of the SGS mining activities should be clearly monitored to calculate the net revenue, rather than the current system of ‘gross revenue’
11. The regulation to manage SGS should not create conflict among MoFALD/DDC, MOSTE, MoFSC, MPPW, and MoI

The positive development in this sector is that the MoFALD is serious in better management of the sand mining operations in the country. The existing guidelines are being seriously reviewed currently. The MoFALD has completed the draft of the Resource Booklet on Environment Friendly Infrastructure Development.

Annex A: Organizational Structure of Chitwan District Development Committee

The Organizational Structure of Chitwan District Development Committee is given below.

