

Green Roads for Water

Workshop/Training in Nepal



Organized by

METAMETA

Kathmandu, Nepal

17-18 December 2019



Date and venue of the workshop/training

The workshop/training on “*Green Roads for Water*” took place on the 17th and 18th of December 2019 at the Yellow Pagoda Hotel in Kathmandu, Nepal. Detailed schedule of the 2-day workshop/training can be found at Annex 1.

Objectives of the workshop/training

- Understand the challenges in road development and climate change
- Learn and share about road water harvesting globally
- Discuss how to apply techniques of ‘green roads for water’ in different regions of Nepal
- Work on initiatives for implementation and promotion

Participants

The workshop/training was attended by 22 people with representatives from the Department of Local Infrastructure (DoLI), the Department of Roads (DoR), the Water Resource Research and Developing Center (WRRDC), the Godawari Municipality in Kathmandu Valley and the World Bank. The participants list can be found at Annex 2.

Presentations

The workshop/training was officially opened by Er. Maheshwor Ghimire, a Senior Divisional Engineer, at DoLI. Maheshwor Ghimire highlighted the benefits of road water management and the necessity to adopt the Green Roads for Water aspect in the design and construction of roads in Nepal.

A. Technical Session

1. Introduction to the global “Green Roads for Water” movement by Frank van Steenbergen

During this presentation Frank explained the concept of Green Roads for Water and highlighted its multiple benefits. Further, he gave some examples of different roads water management techniques that can be used in different landscapes (plain, hilly, and mountainous areas) depending on the local needs. Finally, he showed some good examples of road water management that MetaMeta have implemented in different countries under “Green Roads for water” programme.

2. Opportunities for roads as instruments for climate change in hilly and mountain areas of Nepal by Saroj Yakami

During this presentation, Saroj suggested the road water management measures that can be taken in hilly and mountain roads of Nepal in order to reduce the damages on road infrastructure due to water, improve the landscape around the roads and to improve the livelihood of the communities living around the roads. Some examples of

those measures include management of roadside springs, controlled road water crossings, water harvesting from roads, water storage techniques, slope protection and water retention by using spoils from road construction, roadside tree plantation etc.

3. Issues and challenges in local road network development and integration of water management by Maheshwor Ghimire

Er. Maheshwor Ghimire from DoLI highlighted the difficulties of building roads in Nepal due to the unique and different geography which includes hilly and high mountains areas. He mentioned that 60% of roads are unusable during the monsoon season (most of these roads are rural roads). He also mentioned that the rapid and ineffective road construction in Nepal placing increasing pressure on fragile ecosystems, wasting government resources, and increasing risk to road passengers and roadside dwellers. He highlighted that the situation is worsening due to the intensifying rainfall attributed to climate change and he expressed the necessity for integration between water management and road development. Maheshwor said that the issue of poorly designed roads in Nepal is mostly a political rather than technical issue and that federalism power can bring safer and more sustainable roads.

4. Issues and challenges in strategic roads in Nepal and integration of climate change by Rohit Bisural

The first point Er. Rohit mentioned during his presentation was that water is the biggest enemy of roads and water management need to be considered in the design and construction of roads. Rohit also mentioned the most common issues/problem on roads due to water in different regions in Nepal i.e. plain, hilly and mountainous areas and suggested techniques that can be used or suitable for different geographies. He also mention about the relevance of *water auditing* during design phase of roads for road resiliency to overcome with climate change issues. He further explained different types of support needed by the government in order to sort out these issues. Rohit concluded that the coexistence of road with water is possible by proper planning of roads in the design phase and he highlighted that this measure is cost effective and sustainable.

5. Bio-engineering in road development and lessons learned by Shiva Adhikari

During this presentation, Shiva gave a definition of bio-engineering and then he explained the engineering functions of vegetation that can protect and stabilize the slopes. Based on the Nepali experience in bio-engineering, Shiva highlighted that bio-engineering in combination with civil engineering structure has been proved a cost effective solution to a range of slope instability issues. He mentioned multiple examples of bio-engineering techniques such as protection of uncompact soil, protection of bare cut slope, stabilization of gullies, prevention of shallow slumps etc. Further he discussed about how to select plant species for different measures.

6. Opportunities for roads as instruments for climate resilience in plain: Terai of Nepal by Saroj Yakami

During this presentation, Saroj explained the difficulties and the necessity of applying road water management in Terai plain of Nepal. He started his presentation by

showing examples of challenges in road construction in Terai due to water. Later he highlighted the opportunities of road water management in Terai for beneficial flood management, groundwater management and agricultural water management.

B. Visioning Session

The visioning session took place the first day of the workshop/training. During this session, the participants were asked to close their eyes for 1 minute and dream about where Nepal be in 10 years in terms of water, roads or/and environment. After this, the participants were given 10 minutes to individually visualize their dream on a paper. Then were asked to explain their vision to a group (3-6 people in a group). Later, each participant in the room were requested to stick his/her paper on the wall under three main themes: water, roads and environment. In the end, all the participants walked along the three different themes and discussed how they want to see their country in the next 10 years. The discussion between the different organizations during visioning session was very valuable for the participants to both express their vision and to explore what other organizations or individuals want for Nepal in terms of roads, water and environment. Some activities of the visioning session are indicated in the picture (Fig. 1) below.



Figure 1: Visioning Session

C. Poster discussion

The poster discussion took place at the end of the first day of the workshop/training. During this session, the participants were divided in three groups. Each group are tasked to correspond on three different questions below:

Group 1- What can we do to systematically integrate roads for water (including bio-engineering) in strategic road development and maintenance? What are the things that can be done in the next 3-6 months?

Group 2 - How can we support municipalities to improve the quality of non-engineered roads including roads for water? What are the things that can be done in the next 3-6 months?

Group 3 - Can we think of a large program to systematically introduce good practice the road water harvesting and bio-engineering in certain road sections (how, where)? What are the things to do in the next 3-6 month?

In the beginning, the participants were asked to individually answer the question then correspond to their group on a paper and then to stick the paper under this question. After that, the participants were asked to discuss these points and to identify initiatives per group. At the end of this session, all groups came up with preliminary initiatives regarding the task they were requested to work on. The preliminary initiatives that came up per group are indicated in the picture (Fig. 2) below.

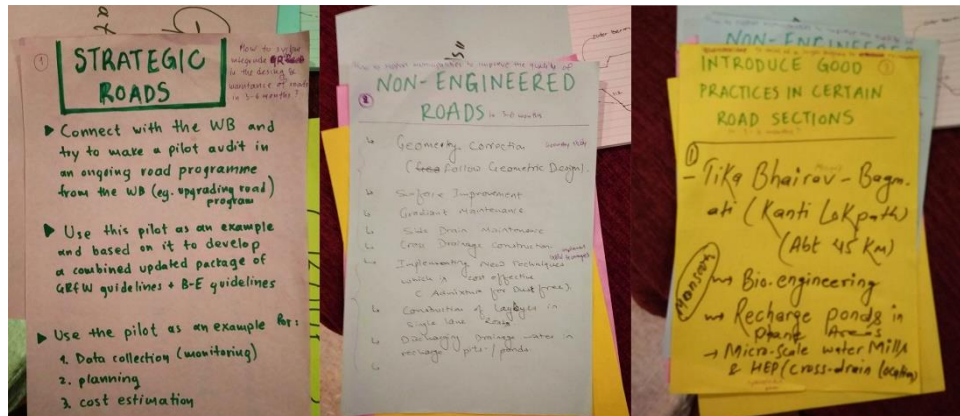


Figure 2: Preliminary initiatives that came up during the poster discussion session.

D. Developing initiatives discussion and planning

This session took place on the second day of the workshop/training. During this session, the participants continued to work in the three different groups formed on the first day. They were asked to discuss the initiatives that they develop the previous day and try to come up with an action plan. To finalize the action plan, each group were asked to answer four questions: (i) What we will do? (ii) What we want to achieve? (iii) Who will do what? and (iv) What is the role of government and what is the timing of activities? The action plans that developed by each collection group are presented in Annex 3.

Outcomes of the workshop

- Participants gained a good knowledge about “Green Roads for Water” approach. They have good access to reference material for it.
- Ideas were developed to integrate roads for water harvesting in strategic roads, non-engineered roads that will support Department of Roads and local government units (municipalities) for future planning and designing of roads
- Participants have developed a plan for the initiatives of green roads for water in the few roads project they are involved in. For instant, in Tikabhairav-Bagmati roads of about 45 km stretch, they have planned for various activities like bioengineering, recharge ponds, water mills development etc. While developing a plan, they were able to figure out different stakeholders for its implementation.

Annex1: Program Schedule

Date	Time	Activity	Responsible Person
Tuesday 17 th December	09:00- 09:30	Registration	MetaMeta
	09:30 – 09:45	Opening speech	DoLI
	09:45 – 10:00	Overview and expectations Getting to know each other	MetaMeta
	10:00- 11:00	Introduction to the global “Green Roads for Water” movement	MetaMeta (van Steenberg)
	11:00 – 11:30	<i>Tea/coffee Break</i>	
	11:30- 12:30	Visioning Session	MetaMeta
	12:30-13:00	Opportunities for roads as instruments for climate resilience in hilly and mountain areas of Nepal	MetaMeta (Yakami)
	13:00 – 14:00	<i>Lunch Break</i>	
	14:00 – 14:30	Issues and challenges in local road network development and integration of water management	DoLI (Maheshwor Ghimire)
	14:30 – 15:00	Issues and challenges in strategic roads in Nepal and integration of climate change	DoR (Rohit Bisural)
	15:00 – 15:30	<i>Tea/coffee Break</i>	
	15:30 – 17:00	Poster Discussion: Building on opportunities	All participants
Wednesday 18 th December	09:00 – 09:15	Brief summary of the previous day	MetaMeta
	09:15 – 09:45	Bio-engineering in road development – lessons learned	DoR (Shiva Adhikari)
	09:45 – 10:15	Opportunities for roads as instrument for climate resilience in plain: Terai of Nepal	MetaMeta (Yakami)
	10:15 - 11:00	Developing initiatives - discussion	All
	11:00 – 11:30	<i>Tea/coffee Break</i>	
	11:30 – 13:00	Developing common initiatives - planning	All
	13:00 – 14:00	Final discussion and Closing	
	14:00 – 15:00	<i>Lunch Break</i>	
	15:00-17:00	Specific follow meetings (on demand)	

Annex 2: Participants Information

No	Name of Participant	Name of Organization/Position	E-mail address
1	Mahesh Chandra Neupane	DoLI/SDE	neupanemc@gmail.com
2	Maheshwor Ghimire	DoLI /SDE	maheshwor2015@gmail.com
3	Maheshwori Khadka	DoLI /Engineer	khadkamaheshwori@gmail.com
4	Shradha Poudyal	DoLI /Engineer	shradhapoudyal@gmail.com
5	Er. Rohit Bisural	DoR/SDE	rohitbisural@gmail.com
6	Er. Shiva Raj Adhikari	DoR/Engineer	shivarajadhikari@hotmail.com
7	Manoj Aryal	DoR/Environmental Inspector	manojaryaldoenv@gmail.com
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20	Narayan Dahal	Engineer/Dol	dahalnarin49@gmail.com
21	R. K. Shrestha	Road affected activist	
22	Ramesh bhattarai	DoLI/ Engineer	princegg.ress@gmail.com

Annex 3: Outcome of Poster discussion

Table 1: Group 1 - What can we do to systematically integrate roads for water (including bio-engineering) in strategic road development and maintenance? What are the things that can be done in the next 3-6 months?

Strategic Roads	
What we will do?	<ol style="list-style-type: none"> 1. Data collection from existing sources 2. Data from design reports 3. Identify sources of water from river alignment 4. To know present situation 5. How we can use this water for beneficial use as: irrigation, drinking water for people traveling on the road 6. Preliminary study from maps and go for reconnaissance 7. Check the obtained data from maps by field verification 8. If additional things required, we should go for that 9. Basically, road follow existing river alignment valley and so many crosses the road by river. We will find out how this water will be smartly managed for Beneficial purpose
What we want to achieve?	<ol style="list-style-type: none"> 1. Show the roads with application of GRfW concept 2. Water auditing 3. Smart & beneficial use of water than wasting it
Who will do what?	<ol style="list-style-type: none"> 1. Department of Roads (DoR) 2. Stakeholder, organization related to DoR 3. DoR with MetaMeta
What is the role of government?	<p>Government has to agree and lead the prospect Government has to coordinate Government has to provide proper space and authority</p>
Timing of activities?	3-6 months

Table 2: Group 2 - How can we support municipalities to improve the quality of non-engineered roads including roads for water? What are the things that can be done in the next 3-6 months?

Non-Engineered roads (Godawari Municipality Roads)	
What we will do?	<ol style="list-style-type: none"> 1. Technical auditing of existing non-engineered roads (geometrical research) 2. Maintaining geometric Standards 3. Providing proper drainage system 4. For new road construction <ul style="list-style-type: none"> • Stop constructing non-engineer roads • Road construction only after DPR (no budget allocation without DPR) • Road construction only after environmental assessment (no budget allocation without environmental assessment)
What we want to achieve?	<ol style="list-style-type: none"> 1. Engineered roads 2. All season functioning roads 3. Systematic maintenance management 4. Green Roads 5. Road Water management for multiple purposes
Who will do what?	<p>Policy maker → Commitment DoLI, MetaMeta → Capacity development for technical support Technical person → Implementation Local community → Road maintenance and bio-engineering</p>
What is the role of government?	<p>Federal Government/ Provincial Government:</p> <ul style="list-style-type: none"> • Making policies, guidelines, standards, norms, working procedures • Budget planning, allocation and sanction • Capacity building program <p>Local Government:</p> <ul style="list-style-type: none"> • Planning and budgeting • Action Plan • Implementation • Operation & Maintenance • Capacity building • Water auditing
Timing of activities?	<p>3-6 months:</p> <ul style="list-style-type: none"> • Grade maintenance • Road-side drain construction • Graveling on earthen roads • Road inventory • Geometry correction <p>>6 months:</p> <ul style="list-style-type: none"> • Bio-engineering • Road Water Management plan • Upgrading earthen drain • Cross drainage structure • Recharge ponds • Upgrading road surface

Table 3: Group 3 - Can we think of a large program to systematically introduce good practice the road water harvesting and bio-engineering in certain road sections (how, where)? What are the things to do in the next 3-6 month?

Good Practices in Tikabhairav-Bagmati Road Section of Kanti Lokpath (45 Km)		
Bio-Engineering		Remarks
What we will do?	Bamboo crib-wall, wattle, fascines, palisades, brush layering, grass plantation, jute netting, surface & Subsurface drainage management	Depending upon the site inspection
What we want to achieve?	Slope stabilization, Water management & Sustainable traffic flow	
Who will do what?	Research institutions: Academic and Private Research engaged for the site specific solutions DoR: Contract management and Implementation	Pubic consultation and participation during implementation
What is the role of government?	Supervision, Facilitation, Monitoring and Evaluation	
Timing of activities?	Planning: 3 months Site preparation & Implementation: 3 months (Pre and Monsoon season) Management and Maintenance: year round	
Water Recharge ponds		Remarks
What we will do?	Construction of small scale water recharge ponds in plane area Rehabilitation of older pond (if any)	Research (geological) prior to site selection
What we want to achieve?	Ground water recharge	
Who Will do what?	Research institutions: Academic and Private Research engaged for the site specific solutions DoR: Contract management and Implementation	Pubic consultation and participation during implementation
What is the role of government?	Supervision, Facilitation, Monitoring and Evaluation	
Timing of activities?	Construction of recharge ponds: Pre monsoon season Management of ponds: monsoon season	
Small scale watermills & HEP		Remarks
What we will do?	Construction of small scale water mills at cross drainage sites	Depending upon the site inspection
What we want to achieve?	Tapping waste water potential (Waste to energy)	
Who Will do what?	Research institutions: Academic and Private Research engaged for the site specific solutions DoR: Co-ordination with locals Public: Participation and involvement (Ownership)	Strong Role and commitment of Locals
What is the role of government?	Facilitation	
Timing of activities?	Planning and construction: Pre-monsoon season Operation: During monsoon and Post Monsoon	Post Monsoon (Depending upon water availability)