

# Open Webinar: Green Roads for Water for Resilience and Recovery

April 15, 2020 11:45 am (CET)



SCAN ME





**Green Roads for Water, are not only means of transport from A to B but can be instruments for improved livelihoods, for water management, climate resilience and recovery**

**Les routes vertes pour l'eau ne sont pas seulement des moyens de transport de A à B mais peuvent être des instruments pour améliorer les moyens de subsistance, pour la gestion de l'eau, la résilience climatique et la récupération**



**As Estradas Verdes para Água, não são apenas meios de transporte de A para B, mas podem ser instrumentos para melhorar os meios de subsistência, para gestão da água, resiliência climática e recuperação**

**الطرق الخضراء للمياه ، ليست فقط وسيلة نقل من أ إلى ب ، ولكنها يمكن أن تكون أدوات لتحسين سبل العيش ، لإدارة المياه ، والمرونة المناخية والانتعاش**



# Roads affect the hydrology of entire areas...

- They block and guide water
- They concentrate runoff
- They interfere with subsurface flows
- They change flooding patterns
- They get damaged in this process



# Impact of Roads on landscape, surface hydrology and livelihoods



**Erosion and  
sedimentation**



**Local flooding**

**Roads  
are a  
major  
cause of:**



**Water logging  
(crop loss and health problems)**



**Dust  
(Health problems and crop loss)**





**This can be**



**And roads and water  
can become friends**

**Green Roads** can be used to harvest road-runoff that previously would cause flood damage and guide it to recharge areas, surface storage places or distributing it over farmland



# What Are the Green Roads for Water?



- **Roads that increase the climate resilience of rural communities**
  - Roads that are instruments for beneficial water management
  - Roads that reduce land degradation and promote good land management
  - Roads that improve the water supply of rural communities
  - Road that are used for flood protection and flood relief
  - Roads that provide employment opportunities to rural communities
- **Roads that have secure transport functions**
  - Roads that connect rural communities to foods, services and markets

# Why Green Roads for Water: **Big Scale and Big Impact**



**Roads are major  
investment globally  
(1-2 Tr USD/year)**

For instance: It is estimated that 25 million km of paved road-lanes and 335,000 km of rail-track will be added from 2010 to 2050: a 60 percent increase.



**At the same time, water  
causes 35- 80% of road  
damage**

For instance: Transect surveys undertaken along roads in upland Ethiopia and Uganda show that in every 10 km of roads there may be 8 to 25 flash points, such as local erosion, flooding, sedimentation, or waterlogging. Negative impact most severe on the most critical rural community connections.

# Why Green Roads: Big Scale and Big Impact



Many tested Green Roads measures exist, suited to different geographies



Measures are low cost in comparison to total road investment (<5%) – and often saving cost of investment and maintenance



Green Roads can be a main instrument for climate resilience, health and increased agricultural production



Rate of return high (>4 in a year)



# Tested measures: many things can be done



Retaining water with road drifts



Roadside tree planting



Feeding soil moisture with road drainage



# Good news: many things can be done

Gardening with roadside wells



Borrow pit converted to water storage



Road embankment creating storage reservoir

# Good news: many things can be done

Harvesting fodder from culvert run-off



Water from spring opened by road construction



Safeguarding wetland functions with low embankment road



Road side recharge structures



# Good news: many things can be done

Roads created from storage excavation



Roads leading to flood shelters, roads serving as (post) flood shelters as well



Roads controlling water tables between high and low land



Gated culverts for water management



# GUIDELINES: GREEN ROADS FOR WATER

**INTERGRATING WATER MANAGEMENT AND CLIMATE-CHANGE  
ADAPTATION IN THE DESIGN AND CONSTRUCTION OF ROADS**



- Approach
- Geographies
- Techniques
- Governance
- Economics
- Technical
- Annexes

The GL are targeted at road planners and infrastructure investors but also at people working on flood protection, landscape restoration, agricultural development, climate resilience and environment in general

Supported by:



# Green roads for Water in different geographies

## Semi-Arid Areas

### Challenges:

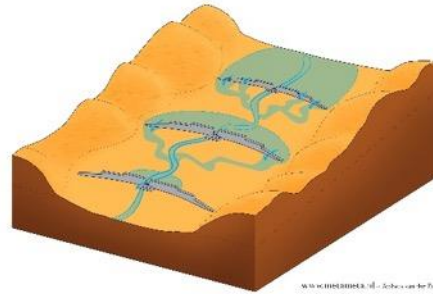
Road run-off causes extensive erosion, flooding and sedimentation but also damage to road bodies.

### Opportunities:

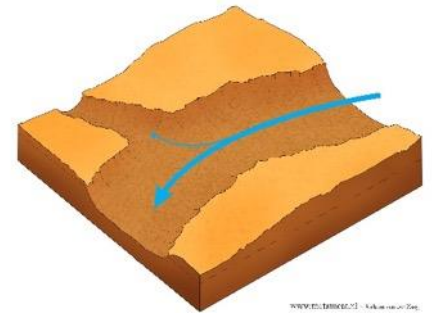
Use of road for water harvesting at large scale (use of harvested water for irrigation, livestock drinking water and groundwater recharge).

### Techniques:

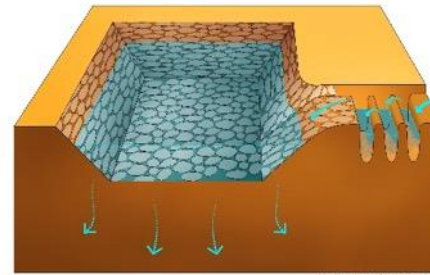
Use of flood water spreaders, flow dividers at culverts, road drifts or road embankments to divert the road run-off to water storage. Use infiltration trenches, converted borrow pits or farm ponds as water storage structures.



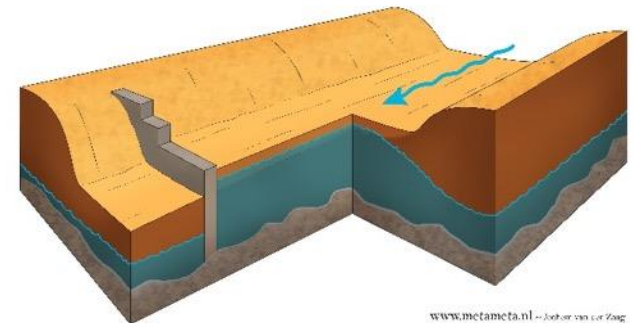
Floodwater spreader



Flow divider



Infiltration trenches



Road drift acting as sand dam



# Green roads for Water in different geographies

## Coastal areas

### Challenges:

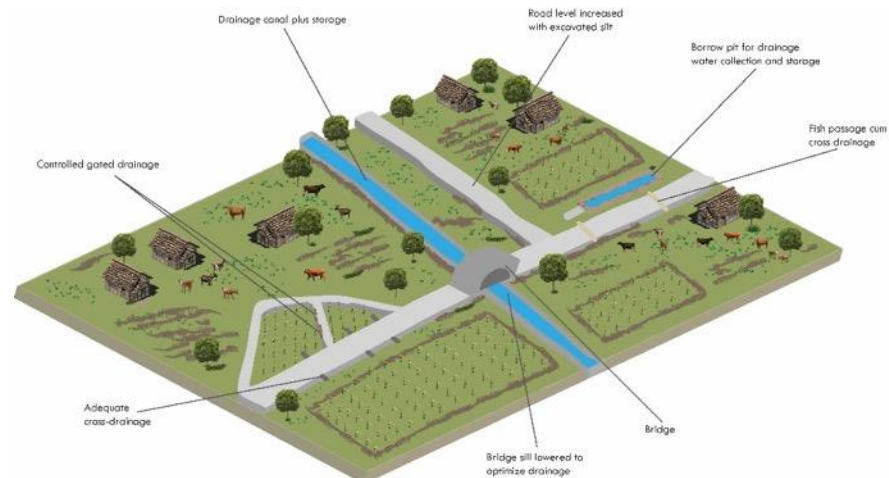
Roads have a major impact on water management which is often manifest in water logging.

### Opportunities:

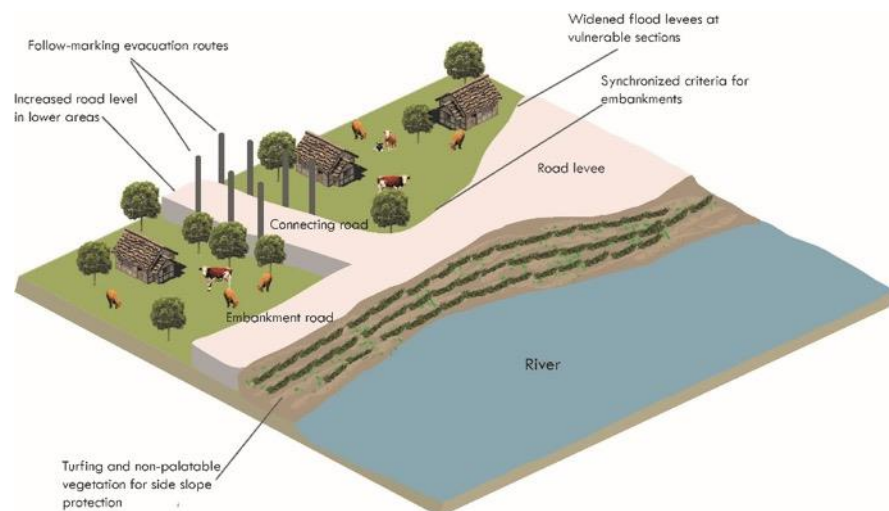
As roads are the main infrastructure in these areas, they can be used to control water levels for productive uses. Such measures contribute also to the longevity of road network. Roads can be also used as flood shelters and evacuation routes.

### Techniques:

Use of road alignment to compartmentalize high and lowlands, adequate cross drainage to retain and release water, using gated culverts for water level control, making use of borrow pits for drainage and water storage using roads for land accreditation.



Recommended best practices in coastal lowland areas



Recommended good practices for roads combined with flood embankments

# Green roads for Water in different geographies

## Mountain areas

### Challenges:

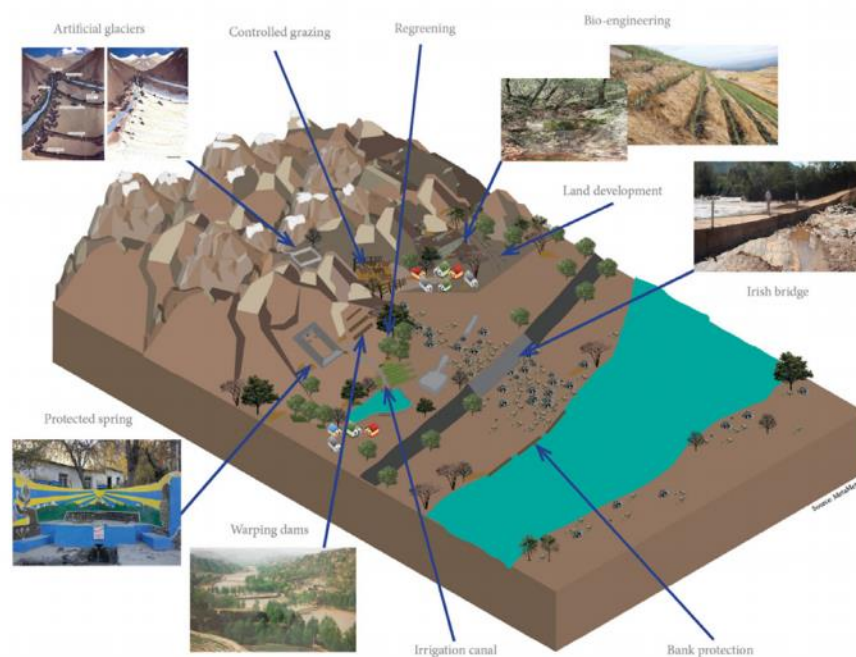
The development of roads in these areas can have a heavy negative impact on the surrounding environment and undermine climate resilience. Road development can change runoff patterns and cause areas to further dry out.

### Opportunities:

Safeguard the road environment with measures that reduce the risk of disturbance whilst also improving the productive value of these areas.

### Techniques:

For the development of new mountain roads, the mass balance method should be considered. Main techniques to manage the water road environment are **spring capture**, reinforced road water crossings and bio-engineering.

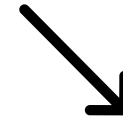


Landscape management measures for mountain areas (Ecosystemic approach)

# Green Roads for Rural Water supply



Even if road surface can affect the water quality, the very large portion of water harvested with roads, originates from the entire catchment. The harvested water can improve the rural water supply by augmenting the resource through recharge and feeding surface storage.



## RWH for groundwater recharge

Use of groundwater for domestic purposes and irrigation



## RWH for water storage

Use of harvested water for irrigation and livestock drinking water



## Roadside spring management

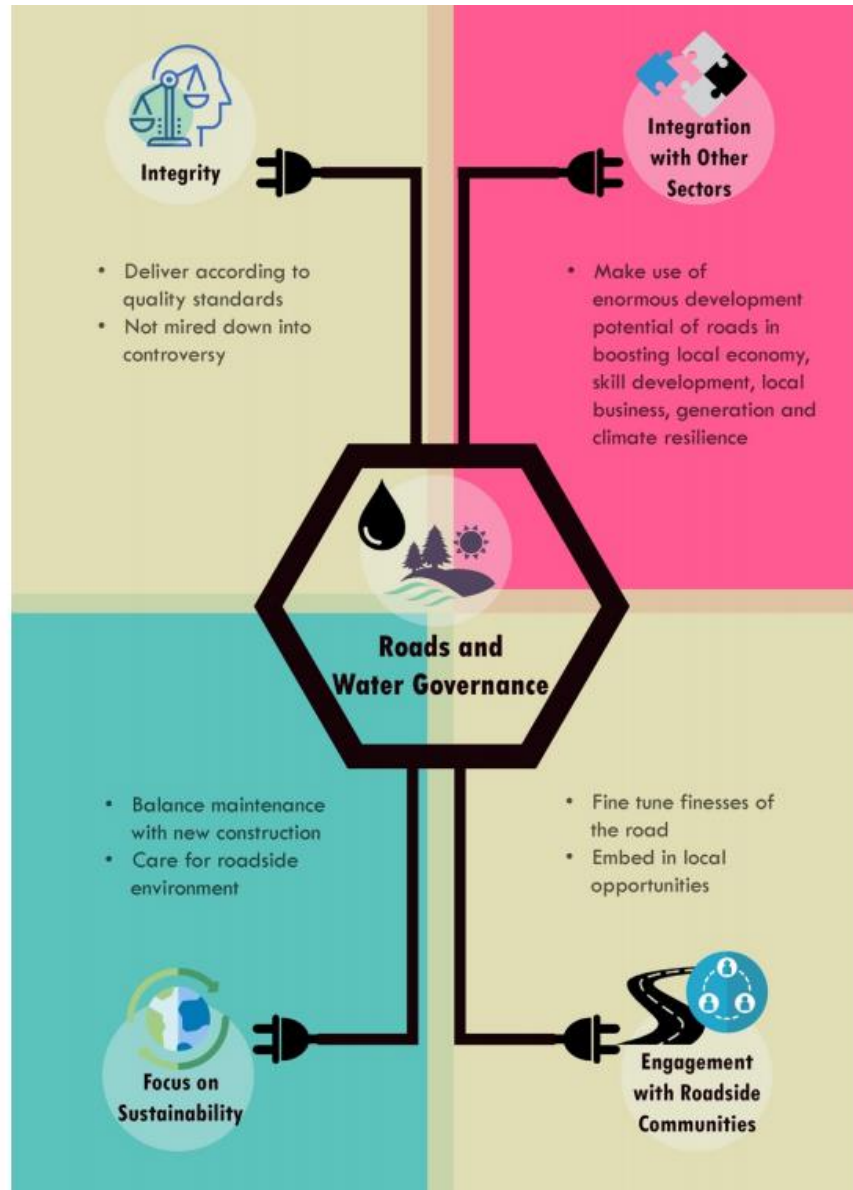
Use of harvested water for domestic purposes





# Green Roads and Water Governance

To get this process going may entail different steps such as fact finding, getting sectors to talk, identify champions, work on early implementation, capacity building and research and consolidation in working methods.

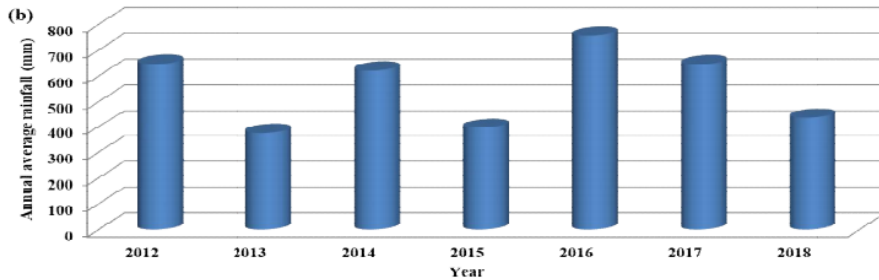
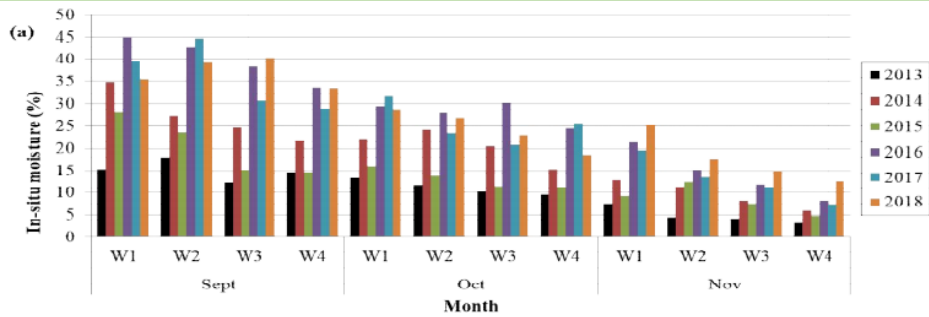


# Three levels of road resilience in different geographies

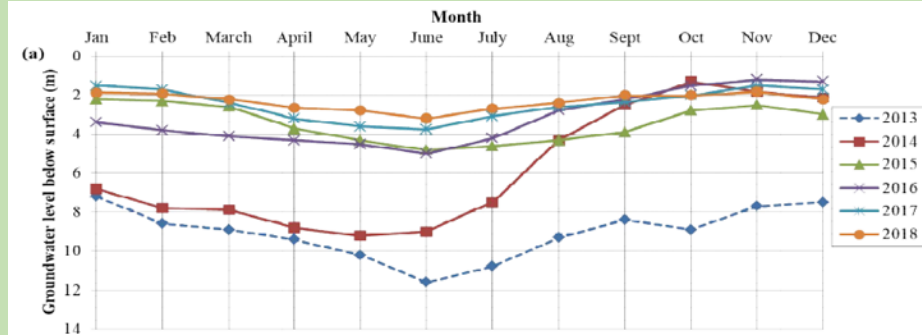
Level of Road Resilience	0 Basic Resilience: Protective	1 Resilience Plus 1: Adaptive	2 Resilience Plus 2: Proactive
Key words	Protecting road infrastructure	Making best use of and adapting to changed hydrology	Redesigning road infrastructure to optimize the area's water management/climate resilience
Geographies			
Semiarid areas	Catchment measures to reduce water damage to roads	Use runoff guided from roads for recharge and storage; upper catchment protection	Design roads and cross- drainage facilities to collect runoff and guide to recharge area
Watersheds and catchments	Catchment protection to protect road infrastructure	Catchment protection to protect road infrastructure	Plan road alignment and drainage structures in support of catchment management
Coastal areas and floodplains	Increase height of flood embankments to deal with higher floods	Convert village roads for water-level management with gated structures	Consider low embankment roads with controlled floodways develop road levees in flood-prone areas; use roads for land accreditation
High- and medium-altitude areas	Have safe road water crossing and protection measures; have adequate road drainage; reconsider road alignment to higher areas; train mountain rivers to reduce exposure of roads to mountain floods	Using water-retention and land-management measures suitable to mountain areas to stabilize mountain catchment and retain moisture and snowmelt; systematic spring management	Use cut and fill instead of cut and throw methods; observe maximum slope and gentle alignments; combine roads with additional storage to and drift for torrent stabilization
Desert areas		Revegetation and dune stabilization using road runoff  Develop small roadside oases taking road runoff to depression areas	Adjust road directions to deal with wind directions to control sand dune formation

# Monitoring the impact of Green Roads in Ethiopia

Kifle, W., Berhane, G., Taye, A., Kebede, M., & Marta, A. P. (2019). Practices and Hydrological Effects of Road Water Harvesting in Northern Ethiopia: Towards Design of Multi-Functional Infrastructures. *Momona Ethiopian Journal of Science*, 11(2), 159-186



(a) In-situ moisture distribution in soils (before and after the construction of structures that divert runoff from culverts into farmlands along the Mekelle road (Kihen), Tigray, Ethiopia. Construction of the diversion structures was done on May-June 2014. Monitoring was done for the period September years 2013 to 2018. (W1= Week one; W2=Week two; W3=Week three and W4=Week four). (b) Rainfall distribution for (ENMSA, 2018).



a) Groundwater fluctuation in Selekleka area, Tigray, Ethiopia (at downstream of a check-dam which was constructed in the period January is designed to store improved at downstream of the box culvert b) Rainfall distribution for the year 2012 to 2018 (ENMSA, 2018)



# Return tend to be high and additional costs low

- **Ethiopia (Tigray)**

- Investment (incl capacity building): USD 3600/10 km,
- Returns/year USD 16879/10 km = factor 4 in one year
  - Reduced maintenance and down time; reduced land damage; benefits of water retained
- Independently verified

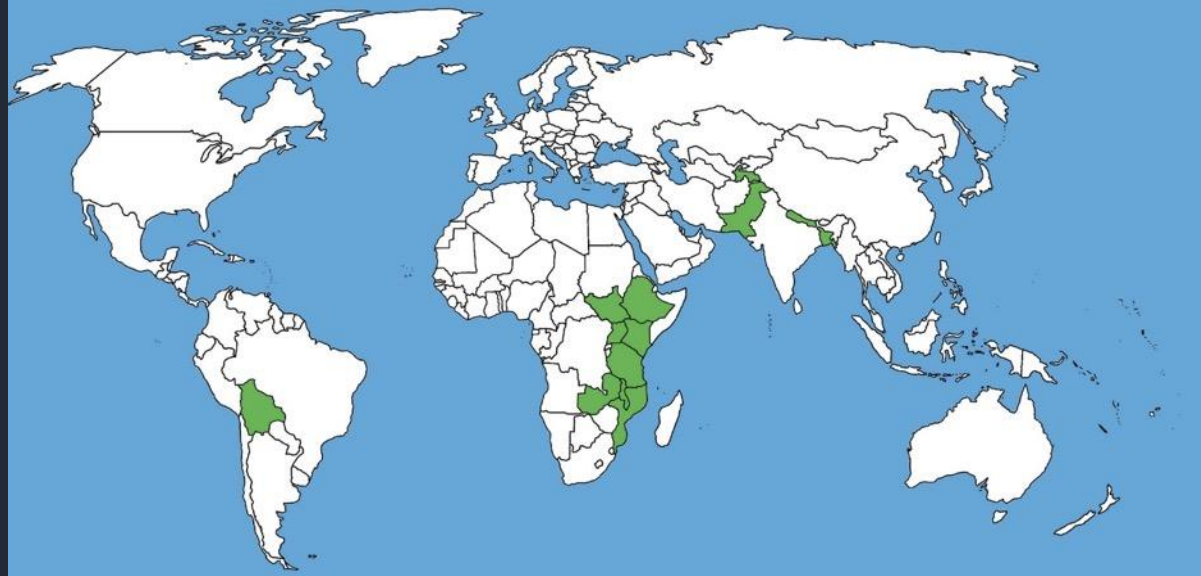
- **Bangladesh (polder 26)**

- Reduced water logging and better water level control (benefitting area 1680 ha)
- Investment USD 200,000; returns/year USD 3.1 M

- **Kenya** – roadside tree planting return factor 4 to 15

- **No / modest additional investment costs – at times even cost savings (low embankment roads, non vented drifts)**

# Green Roads for Water Program



**GREEN** ROADS  
**FOR** WATER

- Aim: To have roads for systematically used for water management, greening and climate resilience and introduce as standard in at least 50% of countries in Asia/Africa by 2025
- Supported by: The World Bank, GRP, ADB, IRF, WFP (in discussion)
- Development of GR4W Guidelines and Guided Learning packages
- Active in more than 10 countries
- Outreach current > 6 M people



## Connecting with (in progress):

### National Programs



### Green Finance Initiatives



### Academia



### United Nations



### Bilateral & Multilateral Organizations



### Private Sector foundations



### Contractors



### Main NGOs







# What is being done?

## 1. Mobilizing Green Finance

- Connect climate finance with road infrastructure
- Develop underlying numericals for additional costs and multiple benefits – co-benefits
- Prepare packages for funding
- Explore Green Bonds for verified Green Road programs
- Co-benefits methodology

## 2. Community of Practice – Learning Alliance

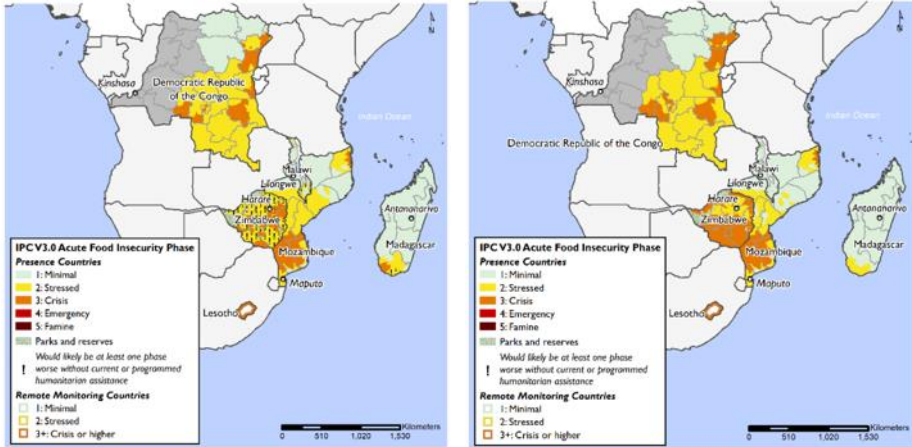
- Learning Alliance (building on [www.roadswater.org](http://www.roadswater.org))
- Promotional training (webinars, blogs, presentation at events) within Bank
- Introduce technical training with (country) training institutes
- Guided learning
- Monitoring and learning: promote and update Guidelines as live document
- Outreach to programs of different organizations

## 3. On the Ground Support

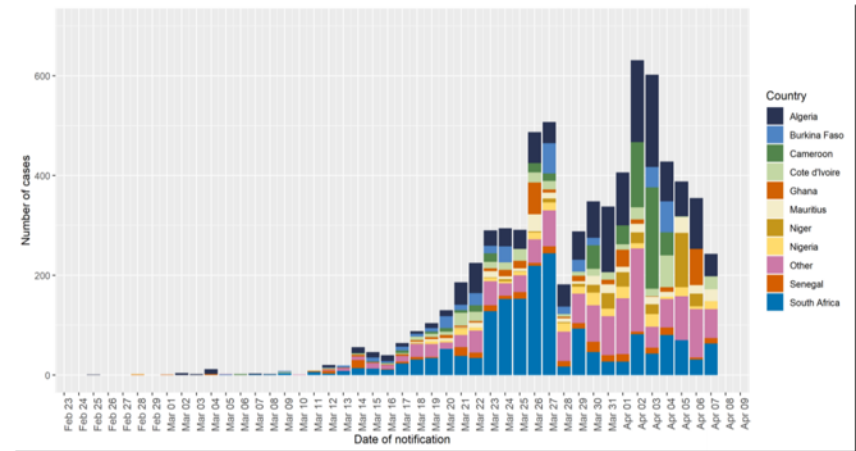
- Special support to road and water investment projects (training, assessment, design)
- Support to national guidelines and capacity building
- Feed into Community of Practice

# Focus on recovery ...

Predicted food security outcome in Southern Africa, February to May 2020 (left) and June to September (right). Source: [FEWS NET](#)



Number of confirmed COVID-19 cases in the WHO African Region by country, 25 February – 7 April 2020. Source: [WHO](#)



## Emergencies (droughts, locusts) do not go away:

- The rainy season across Southern Africa in 2018/19 was one of the driest on record for nearly 40 years
- The severe drought has resulted in below-average regional cereal output and increasing food insecurity across many countries
- Livestock conditions are poor across southern and central areas of the region
- The number of food-insecure people in Southern Africa is projected to peak at 12.5 million through March 2020
- The significant deterioration in food security conditions is mainly due to reduced harvests that have cut household food stocks

## On top of this COVID-19 – infection and quarantining

- Increased morbidity and mortality
- No movement of daily farm labour:
  - Loss of income of most vulnerable group
  - Affects harvested quantities (esp of perishables)
  - More weed infestation – more weed seeds mixed with grains
- Slowed down operations of agri-business and agricultural frontline workers





# Building back better

Employment opportunities for rural communities on road construction





## Related sources

- [Green Roads for Water website](#)
- [Green Roads for Water Guidelines \(supported by the World Bank\)](#)
- **Videos:**
  - [Green Roads for Water: The pitch](#)
  - [Making Roads Work for Water: Local Impressions- Mozambique](#)
  - [Making Roads Work for Water: Impressions from Mozambique](#)
  - [Gender, Rural Roads, and Transport](#)
  - [Road Water Harvesting in Tigray, Ethiopia](#)
  - [Kenya- Catching Road Runoff in Ponds](#)
  - [Connecting Roads, Water, and Livelihoods in Uganda](#)
  - [Roads for Water: Experiences from Malawi](#)
  - [Roads for Water: Zambia](#)





Converted borrow pit for water storage

**Please join  
Thank you!**

**يرجى الانضمام شكرا  
لك!**

**Participe  
Obrigado!**

**Veillez vous  
joindre Merci!**