

Young Researchers' Circle

# Young Researcher

*Rejuvenating research among young aspiring minds*

## GROUNDWATER GOVERNANCE PROSPECTS AND CHALLENGES IN NEPAL

The set of framework and guiding principles that provide an environment for collective management of groundwater for sustainability, equity, and efficiency can be understood as groundwater governance. The groundwater resources vary widely with natural variation and geological heterogeneity. Therefore, governance must be adapted to the local context. Groundwater, being an integral part of the hydrological cycle, needs to be managed in conjunction with linked water and



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land resources. Over time, groundwater extraction in Nepal for different purposes has been growing gradually (driven by demography, technology, and changing lifestyles), resulting in threats to its sustainability. This indicates that sound governance is a pressing priority. However, the development and implementation of several components of the governance are creating a larger governance gap.

In Nepal, intensive groundwater extraction, pollution by inadequate sanitation and wastewater treatment, pollution by industry and agriculture, inequitable allocation, inefficient use, and land subsidence are the key issues and challenges for groundwater management, mainly in bigger cities and the Terai area. In addition to this, the role of groundwater actors and their mode of interaction, regulatory and institutional framework, policies development, and their implementation is not well understood and not in function. Such frameworks and policies need to be revisited for good governance in the groundwater sector. Although several water-related laws and regulations focusing on groundwater have been made, groundwater has practically remained an unregulated resource in Nepal. The cities like Kathmandu have been facing negative consequences like drying of traditional water sources, decreasing well yields, and declining groundwater levels due to excess extraction rather than recharge. Groundwater act, regulation, and policy exist, but the mechanism and dynamics of changes for sustainable management of groundwater have not been properly addressed till date. Overlapping responsibilities and sectoral

conflicts in water institutions in most of the major cities are causing weak governance in the water sector. In addition to this, poor understanding of hydrological dynamics of conjunctive water use and local hydro-geological complexities are also major constraints for sustainable groundwater management through policy formulation and implementation.

Improving groundwater governance is not easy, hence the responsible local institutions have to make their judgement based on the regulation and policies to suggest feasible and effective measures in the current situations. All the relevant parties need to commit and cooperate towards a common goal for effective groundwater governance. Good governance will mainly be guided with four sets of principal and consideration: political and institutional (accountability, representation, consistency, institutional capacity etc.); socio-cultural (religious and spiritual traditions, social learning, social inclusion, ethics etc.); economic (price signal, groundwater storage condition, water quality impacts, willingness to pay etc.); ecological (storage, attenuation rate and renewability, land uses etc.). To improve the groundwater governance, it needs to be treated in a holistic approach and proper management instrument and measures need to be selected based on the local condition. Their effectiveness not only depends on the local physical, institutional, economic and social condition but also on the way these measures are designed and implemented. In addition to this, information and knowledge regarding local conditions need to be shared and awareness related to the baseline of the groundwater resources and their safe limit need to be raised for good groundwater governance. Reaching an effective level of awareness is the first step towards structural communication between decision-makers, planners, groundwater specialists and stakeholders. For adequate groundwater management, a powerful and effectively operating groundwater organization is a must. In addition to this, the laws related to groundwater allow for a connection between the policies of groundwater and those of the related field such as surface water management, land use planning, and environmental protections.

There are nearly 5,00,000 lightning strikes during a monsoon.

- Source: [www.softschools.com](http://www.softschools.com)

A single tree will move 70 gallons of water per day from the ground into the atmosphere.

- Source: [www.aquarionwater.com](http://www.aquarionwater.com)

## Monsoon 2020 in the midst of COVID-19

The sudden outbreak of the COVID-19 pandemic has caused multiple effects on several scientific approaches, including the monsoon expedition launched annually by S4W-Nepal. The expedition is based on mobilizing Citizen Scientists (CS) to measure rainfall throughout the monsoon season (June-September). Recruitment of CS for this expedition is usually done through outreach programs, personal contacts, and social media. The outreach programs are conducted in several institutions with an aim to enroll as well as train the CS in using the rain-gauge and the ODK collect app used in collecting data. Since the conduction of outreach programs was not possible due to the rigid circumstances in the first few months of the year, new CS were only recruited via personal contacts and through social media platforms. Also, due to the lockdown, the CS network of S4W-Nepal couldn't be expanded to other districts as it had been planned earlier.

Young Researchers' Circle (YRC), a network of young researchers formed by S4W-Nepal, played a major role in this CS recruitment process. During the monsoon season of 2020, a total of 51 CS contributed by collecting the daily rainfall data of 47 different sites inside the Kathmandu valley. The CS were categorized as regular, occasional, and irregular on the basis of the frequency of data sent (Fig. 1)

The rainfall measurement was taken using a rain-gauge which was supposed to be provided by the S4W-Nepal team itself. However, during the nation-wide lockdown, some enthusiastic volunteers prepared their own rain-gauge, referring to a tutorial video on the YouTube channel

some locations. There is a slight dip in the amount of rainfall during September, marking the end of the monsoon.



Figure 2: S4W-Nepal rain gauge constructed by some active members of YRC

According to a 42 years average calculation, Kathmandu Valley experiences an average monsoonal rainfall of 1040 mm (Pokharel and Hallett, 2015; Davids, 2019). As per the data of our regular CS, the average monsoonal rainfall of the Valley for 2020 was 1100mm. The hills surrounding the valley receive higher rainfall, which reduces with the altitude. There is a somewhat uniform distribution of rainfall inside the Kathmandu valley.

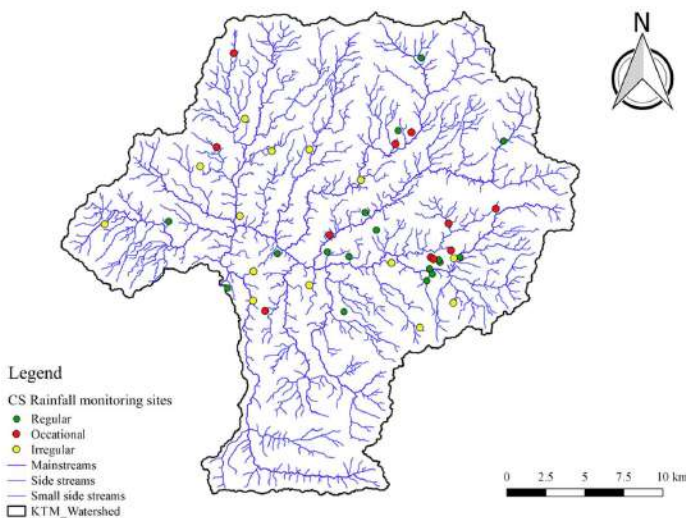


Figure 1: Map showing the location of CS for monitoring rainfall in 2020.

of S4W-Nepal (Fig 2). S4W-Nepal rain-gauge is basically made locally by using a 2.2-liter clear coke or Fanta bottle, a 20cm scale, and some concrete at the bottom for the uniformity of the base for the rainfall measurement.

The CS sent an average of 30-35 data per day through an Android Application, ODK collect (Open Data Kit), which was then quality controlled by the research team of S4W-Nepal. During the process, the numeric entries were compared to the uploaded photo of the rain-gauge, so that more precise and authentic data could be generated. The generated data suggested that July received the highest amount of rainfall followed by August, June, and September as shown by the boxplot in fig 3. Most of the areas in the Kathmandu valley received around 200mm to 400mm of rainfall in the first three months of the monsoon, with the exception of

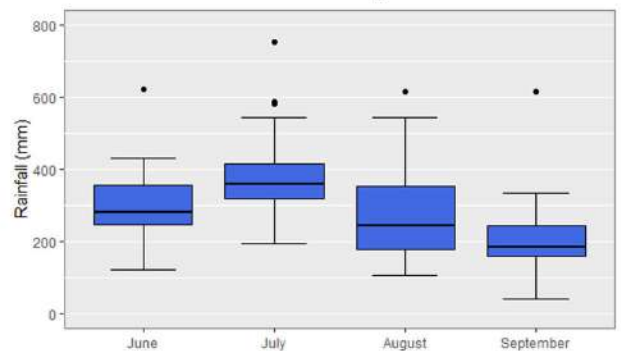


Figure 3: Box plot showing the monthly cumulative rainfall of Kathmandu valley in monsoon 2020

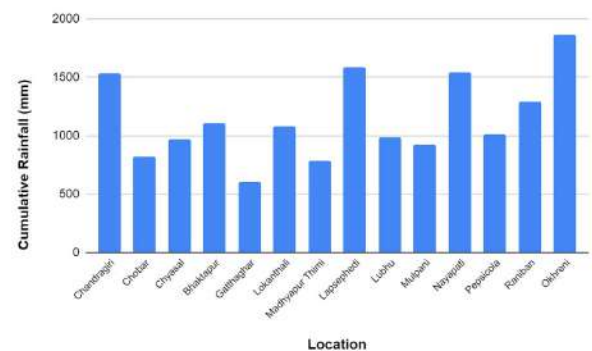


Figure 4: Monsoonal Rainfall of 2020 in the Kathmandu valley

Hence, despite the hurdles brought upon by the pandemic, we were able to generate reliable precipitation data during the monsoon season of 2020. The regular cooperation and enthusiasm of the CS recruited by S4W-Nepal for this expedition were worth appreciating.

**References**

Pokharel, A.K. and Hallett (2015) Distribution of rainfall intensity during the summer monsoon season over Kathmandu, Nepal. *Weather - Royal Meteorological Society* [online]. **70**, pp. 257-261.

Davids, J.C., Devkota, N., Pandey, A., Prajapati, R., Ertis, B.A., Rutten, M.M., Lyon, S.W., Bogaard, T.A. and Van de Giesen, N. (2019). Soda bottle science—citizen science monsoon precipitation monitoring in Nepal. *Frontiers in earth science* [online]. **7**, pp.46.

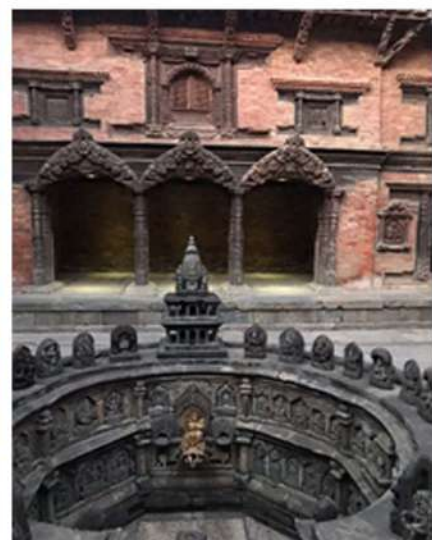
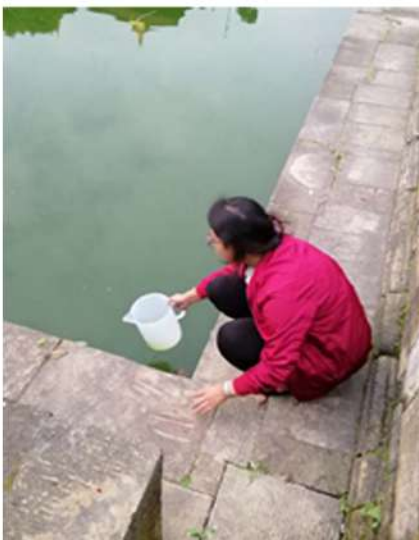
Post-monsoon 2D-LUC Campaign 2019: Citizen Scientist Story

Namaste! I am Shreeya Manandhar, a final year student of Environmental Science from Kathmandu University. I had come across the call for volunteers via S4W-Nepal’s Facebook page, and being a third-year student of Environmental Science back then, I responded to the post with full enthusiasm.

The 2D-LUC campaign, short for Dhunge Dhara-Land Use Classification, was launched by S4W-Nepal for field measurements of stone spouts discharge and water quality, pond water quality, and land use data points within Kathmandu Valley. The primary objective of the campaign was to motivate undergraduate students to participate in water-related research activities. I was among the six selected candidates and had the opportunity to gain first-hand experience measuring different water parameters and mapping different land use categories within my hometown, Lalitpur. I used the Open Data Kit (ODK) application for recording all the necessary data. The main utility of the app is that we can have our data in a well-managed digitized form, rather than having to jot it down into notebooks and manually digitizing them. The work gave me insights into how land use relates to water quality and how heavily some communities are still dependent on the water from stone spouts and ponds. It compelled me to think about their degrading conditions despite them holding such social, historical, and cultural importance. Interacting with the local people helped me better understand their culture and ways of life, and that experience holds a beauty of its own. Moreover, the fieldwork took me exploring so many places in Lalitpur that included the highly populated urban areas I was more accustomed to, as well as the less hustling-bustling peri-urban areas that provided splendid views of nature. If you are someone with interests in water resource management, campaigns like such provide a good opportunity to expand your horizons and broaden your knowledge and are definitely worth your time and efforts.



Shreeya Manandhar  
Citizen Scientist



In Africa and Asia, women and girls spend much of their time collecting and transporting water for their families.

-Water Youth Network.

By 2025, half the world’s people will live in countries with high water stress.

Source: [www.seametrics.com](http://www.seametrics.com)

**Plastics an 'unfolding disaster' for US marine life**

A report shows 1800 cases of animal hurt by plastic since 2009, of which 88% are listed as threatened or endangered under the US Endangered Species Act, including Hawaiian monk seals, Florida manatees, Steller sea lions, and all six species of sea turtle found in the US. Around 90% of the cases involved swallowing plastic while others are entangling and drowning the marine life. The report calls the crisis of plastic in the oceans an "unfolding disaster" that is one of several human-caused factors endangering the planet.

**November 20**

<https://www.bbc.com/news/world-us-canada-55006333>

**Blueprint for a Net-Zero Nepal**

Time for us to cap global warming at below 2°C above pre-industrial levels, as agreed in Paris in 2015. Nepal's annual per capita carbon emission is one of the lowest in the world at 0.29 tons. Manjeet Dhakal, an adviser to the Least Developed Countries support group at the UN Framework Convention on Climate Change (UNFCCC) says: "I am confident we will achieve net-zero by 2050". He added that what is important in this discussion is that, while we may be among the smallest emitters, our emissions are increasing, and forests are not absorbing CO as they used to. So, what are our Nationally Determined Contributions (NDCs) to reduce the impact of the climate crisis and is it practically sound or too easy to achieve?

**November 29**

[http://www.digitalhimalaya.com/collections/journals/nepalitimes/Nepali\\_Times\\_1037.pdf](http://www.digitalhimalaya.com/collections/journals/nepalitimes/Nepali_Times_1037.pdf)

**Myagdi's Orange Village: 4 million oranges in one village**

Baskuna Village in Beni Municipality-4 is popularly known as Orange Village due to the presence of an orange garden in every household. The people of Baskuna village have stopped paddy farming



started cultivating oranges. Twenty-five households in Baskuna have grown oranges commercially. Tilak Gurung, Agricultural Corporation chairperson, said that the village earns Rs 3-4 million a year from the sale of oranges. According to Gurung, PM's Agricultural Modernization Project has helped the district provide irrigation facilities, training, and technology. Using modern technology, farmers in the village have received training on orange orchard management, planting methods, training, and procedures to be adopted for delicious fruits.

**November 30**

[https://gorkhapatraonline.com/featured/2020-11-30-27410?fbclid=IwAR3ItXaeufiZveTwQUML6Aq\\_gcX3rr2610PXD E4K5h-VFqXapHw3ArKIOA0](https://gorkhapatraonline.com/featured/2020-11-30-27410?fbclid=IwAR3ItXaeufiZveTwQUML6Aq_gcX3rr2610PXD E4K5h-VFqXapHw3ArKIOA0)

**Rare wild pigeon sighted in Nepal**

The sighting of a Green Imperial Pigeon (*Ducula aenea*) by wildlife photographer Devendra Kharel in Nepal for the first time has taken the total bird species in the country to 887. Nepal has early 10% of all bird species found worldwide, and among them, 77 are mostly migratory birds, seriously threatened. A further 167 species are nationally threatened.

**November 28**

<https://www.nepalitimes.com/latest/rare-wild-pigeon-sighted-in-nepal/>

**Chitwan National Park investigates rising deaths of rhinos**

Chitwan National Park home to the nation's largest rhino population i.e six hundred and five has been suffering from unprecedented deaths of one-horned rhinos. According to Ananath Baral, chief conservation officer at the park, most of the deaths are caused due to monsoon related incidents like floods. Studies are being carried out to know more about the situations and to plan for minimizing them soon.

**November 30**

<https://kathmandupost.com/environment/2020/10/29/chitwan-national-parkinvestigates-rising-deaths-of-rhinos>

**Wildlife ambulance in Pokhara**

A 'Wildlife' ambulance service will be launched in Pokhara to rescue injured and stranded wild animals. The double cab pickup van purchased by the Gandaki government with budget management has been turned into an ambulance. Maheshwar



Dhakal, Secretary at Ministry of Industry, Tourism, Forest and Environment, added that a trolley is also available in the ambulance to keep the wildlife safe. The ministry had allocated NRs 4.1 million for the purchase of ambulances. An ambulance will be used to rescue the injured wild animals, treat them, and take them under control or leave them in a safe place. The technical manpower to be deployed in ambulances has not been managed yet.

**December 2**

[https://ekantipur.com/news/2020/12/02/160687934974176587.html?fbclid=IwAR35zNj6aybhO3C3Nhz2B\\_nGx7hcRbMd5kxbKp4\\_VdzW0K0Vo\\_CrKcW7wc](https://ekantipur.com/news/2020/12/02/160687934974176587.html?fbclid=IwAR35zNj6aybhO3C3Nhz2B_nGx7hcRbMd5kxbKp4_VdzW0K0Vo_CrKcW7wc)

**Shrinking Fewa lake to be declared 'Fewa Wetland Conservation Area'**

Fewa Lake, which has lost a huge portion of its precious land to illegal constructions around, may soon be declared a conservation area. The stakeholders have planned to declare it 'Fewa Wetland Conservation Area' and restrict commercial activities in the periphery. The government, locals, and other parties have come together for the cause. "Fewa is considered the 13th beautiful lake worldwide. It is the pride of Pokhara as well as of the entire nation. But its shrinking size is worrisome and it's crucial to fix this problem," said Bain Bahadur Adhikari, Chief of Fewa Lake Conservation District Coordination Committee, who is also the chief of the Forest and Land Conservation Department, Kaski. Tirtharaj Adhikari, Chairperson of Pokhara Metropolitan-17 meanwhile said that "We are not only looking at the lake; the entire wetland area should be protected and we local representatives are for the same."



**December 12**

<https://myrepublica.nagariknetwork.com/news/shrinking-fewa-lake-to-be-declared-fewa-wetland-conservation-area/>

**Mustang people on the verge of leaving ancestral land; lack of irrigation facility 'leaves no other choice'**

People in some villages in Mustang have decided to leave their ancestral land out of no choice. The terrains where they could grow valuable crops, fruits, and vegetables have gone barren due to the lack of irrigation facilities. The locals have expressed grief over the apathy shown by the government. "Our soil is suitable for potatoes, green leaves, barley, and apples, but our lands are barren," said Dhawa Gurung, the Chairperson of Lo Ghekar Damodarkunda Rural Municipality - 3. He added, "We are tired of asking for irrigation facilities. Now we want to be relocated, though leaving the land of our ancestors is very painful". According to Gurung, there are 68 households in his ward. Villagers are now waiting for the government to relocate them since the problem in irrigation will not be addressed.

**December 13**

<https://myrepublica.nagariknetwork.com/news/mustang-people-on-the-verge-of-leaving-ancestral-land-lack-of-irrigation-facility-leaves-no-other-choice/>

**Living in the forest, Chure landslide victims**

The victims of the landslide hit on Chure Terai of Kailali have had no rehabilitation made for six months. They are living under tents near Pashupati Community Forest in Gauriganga Municipality-1. More than 100 landslide-affected families from Chure Village Municipality 4, 5 and 6 are living there. Families whose houses were completely and partially destroyed by the landslide due to incessant rains from July 29 to 30 were living in community schools, relatives while some half-destroyed houses and some families were living in the Khani-danda section of Bhimdatta Highway.

**December 17**

<https://ekantipur.com/news/2020/12/17/160816893572637229.html>

**Crocodile Breeding Center in Chitwan in the need of potent male crocodile**

The lack of potent male crocodiles in the Crocodile Breeding Centre at Kasara, Chitwan district has been a cause of concern for the officials as it would lead to zero



reproduction of hatchlings. There is only an old male crocodile of 42 years old. It has ceased engaging in reproductive activities due to which 300 eggs laid by female crocodiles in last April could not be hatched, said Chitwan National Park's Assistant Conservation Officer Mr. Bed Bahadur Khadka. The park had already brought the issue to the notice of the authorities concerned last July. Preparations were made to bring a male crocodile of reproductive age from Bardiya National Park, informed Haribhadra Acharya of the Department of National Parks and Wildlife Conservation. Altogether five male crocodiles were reported in the Rapti River and the Narayani River, but they could not be trapped and used for reproductive purposes as those reptiles were yet to reach their reproductive age, added Assistant Conservation officer Khadka.

**December 14**

<https://myrepublica.nagariknetwork.com/news/crocodile-breeding-centre-in-chitwan-in-need-of-potent-male-crocodile/>

No matter how hard the past, you can always begin again.

- Buddha



S4W-Nepal



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