

## Curriculum Vitae



Name: S. Khanal MSc.  
 First Name: Sonu  
 Date of Birth: 28 January 1989  
 Nationality: Nepalese  
 Main Disciplines: Hydrology, Hydraulics, Hydropower development, Flood Mapping and Forecasting, Weather and Climate, Climate change, IWRM.  
 Telephone: +31 (0) 6 147 202 66  
 Email: s.khanal@futurewater.nl  
 LinkedIn: linkedin.com/in/sonu-khanal

### Key Qualifications

S. (Sonu) Khanal (MSc.) has almost 8 years of experience in hydrology, catchment hydrology and rainfall-runoff modeling, with a strong focus on climate change impact studies, hydrological modeling and Flood Forecasting for operational services. His experiences were obtained at Institute of Engineering (IOE), International Centre for Integrated Mountain and Development (ICIMOD) and Practical Action (PAC), Nepal. His past work at ICIMOD consists of hydrological modeling at various spatial and temporal scales with a strong focus on the use of GIS, remote sensing and big databases.

Over the last year, he focused on the flood risk studies in European catchments, operationalization of the probabilistic flood forecasting at different pilot basins with governmental institution and PAC in Nepal. He has international working experience in countries in Europe, Asia and Africa. He is conducting a combined external PhD research at FutureWater, KNMI and VU Amsterdam titled "Improving future weather techniques for flood forecasting". This research project is funded by the Marie-Skłodowska-Curie European Training Network. Please visit <https://system-risk.eu> for more information about the project.

### Educational Background

2016 – present	Hydrologist/PhD researcher, VU, Amsterdam, The Netherlands
2011 – 2013	Water Resources Engineering, Specialized in Hydropower Development, Tribhuvan University (TU), IOE, Pulchowk Campus, Nepal
2007 – 2011	BE Civil Engineering, Tribhuvan University (TU), IOE, Pulchowk Campus, Nepal

### Selection of Theses, Internships

2016 - Present	PhD Theses: "Improving future weather techniques for flood forecasting"
2014	Internship at ICIMOD under the project "Climate impacts on snow, glacier and hydrology of the HKH region is a project jointly implemented by ICIMOD, NASA, USGS with financial support from USAID/OFDA".
2013 – 2014	MSc. Thesis 'Snow and Glacier melt Quantization Using Energy Balance Model in Marshyangdi River Basin, Nepal, IOE, Pulchowk Campus.
2011	B.E. Thesis "Prefeasibility Study of LikhuKhola Hydropower Project".

## Professional Experience

2015 – present	Hydrologist, FutureWater, Wageningen, The Netherlands Overseas Professional Experience
2014	Water Resources Modeller, ICIMOD, Nepal
2016	Hydrologist, Practical Action Consulting (PAC), Nepal
2015	Teaching Associate, Climate Change and Development Program, Tribhuvan University (TU), IOE, Pulchowk Campus.
As non-resident:	The Netherlands, Mozambique

## Selection of Assignments and Projects Involved

### (a) FutureWater, the Netherlands

2019 – present	Pan-Third Pole Environment project – The project assesses impact of climate change to the Asian water towers and its water resources together with Chinese Academy of Sciences. The project attempts to foster trade, infrastructural development and cultural exchange between Central Asian countries, Pakistan and China. The major responsibilities are to assess the past and future hydroclimatic trend in the region and impact of climate change.
2019	NUFFIC Tailor-Made Training (Advanced cloud computing for water resources management) – One week in country training at Yangon Technological University, Myanmar. The training was focused on the application of open source Google Earth Engine platform for management of floods, drought, erosion and sedimentation issues in Myanmar.
2016 – 2019	System Risk – A Marie-Sklodowska-Curie European Training Network which aims on developing and implementing a systems approach for large-scale flood risk assessment and management. The project assesses risk chain, interactions and temporal dynamics of large-scale floods.
2019	NUFFIC Tailor-Made Training (Google Earth Engine) – A three weeks in country training for Institute of Forestry (IOF) in Nepal. The training addresses the key challenges in managing the flooding issues in Nepal. The training involves the use of open source platform (google earth engine) for flood forecasting under changing climate.
2017 – 2018	Development of preprocessing toolbox of Big climate data (12 TB) using R. The project involves climate risk assessment of different regions in Indonesia, China, Afghanistan using huge data archive of NASA-NEX project. For additional information visit <a href="https://nex.nasa.gov/nex">https://nex.nasa.gov/nex</a> .
2017 – 2018	Hydrological pre-feasibility assessment for the Romuku hydropower plant Central Sulawesi, Indonesia. Project involves hydrological assessment of this pre-feasibility phase, supporting Hydropower Evolutions in the overall assessment. The objective is to undertake a first order analysis on the expected flow in data sparse region including the uncertainties involved for the proposed run-of-river power plant.
2017 – 2018	Hydrological pre-feasibility assessment for the Zoti hydropower plant Northern Georgia. Project involves hydrological assessment of this pre-feasibility phase, supporting Hydropower Evolutions in the overall assessment. The objective is to undertake a first order analysis on the expected flow in data sparse region including the uncertainties involved for the proposed run-of-river power plant.
2017 – 2018	Training for 23 water specialists from India, Nepal, Pakistan, Bhutan, Bangladesh, Afghanistan and ICIMOD staff focusing on using the SPHY model and pre-processor GUIs for the Hindu-Kush Himalayan (HKH) region. The training aimed to implement the

2016 – 2017	<p>model in the HKH region to better understand the glacio-hydrological behavior, water availability and impacts of climate change</p> <p>Assessment of future changes in hydro-climatic extremes in the Upper Indus, Ganges, and Brahmaputra River basins. The objective of the project is to understand the climate change effects on the hydrological extreme in IGB region.</p>
2016 - 2017	<p>Hydropower development assessment for the Tamakoshi River Basin – The objective it to improve the understanding of the expected impacts of climate change on water availability in the context of potential hydropower development in the Tamakoshi River Basin. This project involves selection and statistical downscaling of GCMs, hydrological model calibration, improving SPHY model concepts focusing on glacier dynamics, and WEAP scenarios for hydropower development.</p>
2016	<p>NUFFIC Tailor-Made Training (SPHY modeling) – ARA-Sul and ARA-Norte in Mozambique faced a knowledge gap to adequately manage their water resources and to serve their clients. This training aims to equip these ARAs with additional knowledge to work with the SPHY model as a Water Resources Model.</p>

### **(b) Practical Action, Nepal**

2016	<p>Community Based Early Warning Systems (CBEWS); supported by Zurich Global Flood Resilience Programme and UK Natural Environment Research Council (NERC) in collaboration with Lancaster Environment Centre, Lancaster University: Responsible for orienting and supporting the Department of Hydrology and Meteorology (DHM), Government of Nepal to improve resilience of flood vulnerable communities. Support in testing the operational probabilistic flood forecasting model in the Karnali basin using the FloodforT toolkit and work alongside DHM in operating the system, and support in building the capacity of PAC to use the model.</p>
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### **(c) ICIMOD, Nepal**

2015 - 2016	<p>Himalayan Adaptation, Water and Resilience (HI-AWARE) project, led by ICIMOD, as part of IDRC and DFID's CARIAA programme: The Research Component 1 of HI-AWARE initiative intends to develop mountain specific and basin scale climate change scenarios in the HKH region. This component also assesses the climate change impact on water supply/demand in Indus Ganges and Brahmaputra river basins. One of the major responsibilities was to set up and calibrate the SPHY hydrological model in the selected catchments of IGB.</p>
2015 – 2016	<p>Koshi Basin Programme (KBP), supported by Australian Government – Responsible for assessing water availability in the Koshi basin by applying various hydrological models viz. J2000, GR4JSG, SWAT and SPHY. Assessing the structural uncertainty due to different conceptualization approach of the models.</p>
2014 – 2015	<p>Establishment of a Regional Flood Information System in the Hind-Kush Himalayan Region (HKH-HYCOS); supported by USAID/OFDA and in collaboration with World Meteorological Organization (WMO) - Responsible for the processing and analysis of hydro-met data and flood related data, updating information database to ingest in HYCOS. Investigating the needs and examining the options for the improvement of programme aimed at strengthening the gathering, use and application of weather and climate information across South Asia for better decision making. Providing technical support during piloting of flood outlook in monsoon. Preparing training materials and conducting a regional training on flood outlook development.</p>
2014 - 2015	<p>Integrated Hydrological Modelling HIMALA: Impacts on Snow Glacier and Hydrology of the Hind-Kush Himalayan Region; supported by USAID/OFDA and in collaboration with NASA - Responsible for conducting research on melt contribution from glacier and snow fed catchments in Himalayan region, upstream-downstream linkages and water availability to the downstream users, river dynamics and hydrological modelling.</p>

## Trainer experience

2019	NUFFIC Tailor-Made Training on Advanced cloud computing for water resources management in Myanmar.
2019	Training on Glacio-hydrological modeling (Chinese Academy of Sciences, Beijing, China)
2019	NUFFIC Tailor-Made Training on Use of open source data for hydrological modeling in data sparse region in Nepal.
2017	NUFFIC Tailor-Made Training on Glacio-hydrological modeling using the SPHY-model (ICIMOD, Kathmandu, Nepal)
2016	NUFFIC Tailor-Made Training on SPHY-modeling – ARA-Sul and ARA-Norte in Mozambique to bridge the knowledge gap to adequately manage their water resources and to serve their clients.
2016	Operational probabilistic flood forecasting training using FloodforT toolbox to support practical action consulting, Nepal and Department of hydrology and meteorology (DHM) to improve resilience of flood vulnerable communities.

## Workshop and Conferences

2019 Sep	Oral presentation at System Risk Conference GFZ, Potsdam, Germany.
2018 Dec	Oral presentation at American Geophysical Union (AGU) conference, Washington DC.
2019 Jul	Oral presentation at 'Event definition and characterization workshop' at TU Wein, Vienna.
2018 Apr	Presented a poster in European Geosciences Union (EGU) conference, Vienna, Austria
2018 Jan	Attended 4 day's training on assessment of extreme events (methods and views from natural, engineering and policy perspectives) including quantification and communication of uncertainty, Middlesex University, UK.
2017 Dec	Completed 8-week course on Dynamic Meteorology and Atmospheric Sciences, Wageningen University, Netherlands.
2017 Sep	Presented a poster in International Conference on Flood Management, Leeds, UK
2017 July	Attended 5 day's summer school in Environmental Systems Analysis using Bayesian inference, Eawag - Swiss Federal Institute of Aquatic Science and Technology, Zurich, Switzerland.
2017 June	Attended a 4 days training on system interactions and coupled processes, exploratory modelling, Deltares, Netherlands
2017 Jan	Attended 4 days training on risk analysis and risk management concepts, University of Bologna, Italy.
2016 Oct	Attended 2 day's workshop on planning and managing project, German Research Centre for Geosciences (GFZ), Potsdam, Germany.
2015 Dec	Attended 5 days training on Spatial Process on Hydrology (SPHY) model organized by Future water, Netherland in collaboration with ICIMOD, held at ICIMOD
2015 Jul	Attended one-day workshop on "Urgent Case for Recovery: What can we learn from the August 2014 Karnali River floods in Nepal" organized by Practical Action and Institute for Social and Environment Transition (ISET-NEPAL).
2015 Jun	Attended 2 day's workshop on SWAT Model implications in Koshi held at ICIMOD
2015 Mar	Attended a weeklong International Glacier Symposium (IGS) held at Kathmandu.
2014 Dec	Attended 5 days training on Spatial Process on Hydrology (SPHY) model organized by Future water, Netherland in collaboration with ICIMOD, held at ICIMOD
2014 Sep	Attended a 15 days training on Advanced SWAT modelling organized by CREEW, Nepal.
2014 Jul	Attended International conference on Real Time Flood forecasting system supported by DHI at ICIMOD.
2014 Jun	Attended training on the "Debris covered Glaciers" supported by DFID and Norwegian Ministry of Foreign Affairs at ICIMOD.
2014 Feb	Attended a Regional Training on "Integrated Hydrological Modelling HIMALA: Impacts on Snow Glacier and Hydrology of the Hind-Kush Himalayan Region" supported by International Development Office for Foreign Disaster Assistance (USAID OFDA) and in collaboration with NASA held at ICIMOD.

## MSc Supervision

2019 Smriti Tiwari, Wageningen University, MSc internship on 'Historical Climate analysis of the Third Pole Region'.

## Awards and Grants

2016 Awarded Marie Skłodowska-Curie fellowship scholarship (grant agreement No 676027) by European Training Networks (ETN) to pursue PhD.

2011 Awarded prestigious government of Nepal scholarship to pursue Master of Water Resources Engineering specialized in hydropower development in Institute of Engineering, Nepal.

2007 Awarded prestigious government of Nepal scholarship to pursue Bachelor of Civil Engineering in Institute of Engineering, Nepal.

## Selection of Technical Reports and Other Publications

- **Khanal, S**, Ridder N, de Vries H, Terink W and van den Hurk B (2019) Storm Surge and Extreme River Discharge: A Compound Event Analysis Using Ensemble Impact Modeling. *Front. Earth Sci.* 7:224. doi: 10.3389/feart.2019.00224
- **Khanal, S.**; Lutz, A.F.; Immerzeel, W.W.; Vries, H.; Wanders, N.; Hurk, B. The Impact of Meteorological and Hydrological Memory on Compound Peak Flows in the Rhine River Basin. *Atmosphere* 2019, 10, 171.
- **Khanal, S.**, J.E. Hunink. 2017. Hydrological pre-feasibility assessment for hydropower facility in Northern Georgia. *FutureWater Report 175*.
- Wijngaard, R.R., A.F. Lutz, S. Nepal, **S. Khanal**, S. Pradhananga, A.B. Shrestha, W.W. Immerzeel. 2017. Future changes in hydro-climatic extremes in the Upper Indus, Ganges, and Brahmaputra River basins. *PLOS ONE* 12(12): e0190224.
- Terink, W., W.W. Immerzeel, A.F. Lutz, P. Droogers, **S. Khanal**, S. Nepal, A.B. Shrestha. 2017. Hydrological and Climate Change Assessment for Hydropower development in the Tamakoshi River Basin, Nepal. *FutureWater Report 164*.
- Terink, W., **S. Khanal**. 2016. SPHY: Spatial Processes in Hydrology. Advanced training: input data, sensitivity analysis, model calibration, and scenario analyses. *FutureWater Report 160*.

## Language skills

Nepali:	Mother tongue
English:	Fluent in writing and speech
Hindi:	Moderate
Urdu:	Moderate
Dutch:	Low

## Computer Skills

Hydrological models:	Spatial Processes in Hydrology (SPHY), PCRaster based models, SWAT, Utah Energy Balance (UEB), Geospatial Stream Flow Model (GeoSFM), HEC-HMS, J2000
Hydraulic models:	HEC-RAS, MIKE-11
Planning models:	HEC-RESSIM, WEAP
Programming:	R, Python, Fortran, C++
App development	R-Shiny, PyQt
GIS:	ArcView, ArcGIS, QGIS
Standard software:	MS Office, Open office, LaTeX

Cloud computing  
Others:

Google Earth Engine  
AutoCad, Civil3D, SAP2000