

P170526

# Summary report and list of participants from trainings

**Assessment of Suitable Flood Mitigation Measures (based on Dukniskhevi  
River Extreme Flood Analysis) in Tbilisi, Georgia**

CTCN REFERENCE NUMBER: 2016000043



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## 1 Introduction

The main objective of this consultancy is to improve the flood risk management in the Leghvtakhevi River basin in Tbilisi (Georgia). This will be accomplished through the implementation of a modelling framework, the inclusion of climate change impacts, the definition of flood maps and the designation of flood mitigation and adaptation measures. Capacity building and technology transfer activities will be undertaken too, and will be at the core of the project.

This consultancy started in August 2017 and is due to finish in August 2018 (duration of 12 months). The contract between UNIDO and HYDROC was signed on the 14th of August 2017.

This technical assistance is managed by the CTC-N, the National Designated Entity is the Ministry of Environment and Natural Resources Protection of Georgia, while key stakeholders are the National Environmental Agency Request (request applicant), the Tbilisi Municipality and the Emergency Management Agency under the Ministry of Internal affairs.

This report describes the training given to relevant stakeholders.

## 2 Training Methodology

The objective of the training is that Georgia relevant stakeholders are able to use the modelling framework developed within the framework of this technical assistance to undertake similar studies elsewhere in Georgia. Therefore, the training was focused on the use of these technologies, using the Leghvtakhevi modelling framework as an example.

Special attention was given to the selection of trainees and stakeholders participating in the training. The following list shows organisations that were invited and the reasons behind their selection:

- National Environment Agency (NEA): this is the most relevant stakeholder regarding flood risk modelling. NEA is responsible for the hydro-meteorological network of Georgia and also is responsible for flood hazard assessment. They have a very limited modelling group developed during the implementation of flood risk management projects. They will be the main agency using the modelling framework as developed within this project and also they will be implementing similar frameworks elsewhere.
- Emergency Management Agency (EMA): they are the designated civil protection agency in Georgia and their main role is to respond to emergency situations and to mitigate the impact of disasters. The main idea of involving EMA within the training sessions is to increase their

awareness regarding the type of information that is available from modelling frameworks and flood forecasting systems.

- Ministry of Defence, DELTA: this is the only organisation in Georgia managing a weather RADAR. However, the use of this RADAR for flood forecasting or flood risk management purposes in Georgia is very limited. These data was used intensively during the implementation of the technical assistance.
- Ilia State University: flood modelling is not studied in Georgia in any university studies, and therefore, in order to increase the scope of the training and also in order to increase the number of people with hydraulic modelling capabilities within Georgia, university post-graduate students with a relevant background were also invited.

It should be noted that also staff from other stakeholders (such as the Climate Change Unit of the Ministry of Environment or the Tbilisi City Hall) were also invited, although they could not attend the training.

As it will be described below, the training was very practical, limiting as much as possible the theoretical lessons and focusing on hands-on training as much as possible.

## 3 Hydrological Modelling Training

### 3.1 Summary of training

The hydrological modelling training took place at the Institute of Earth Sciences and National Seismic Monitoring Centre, Ilia State University from the 14<sup>th</sup> May – 25<sup>th</sup> May 2018. In total 19 participants from five institutions were present during the training, of which eight trainees took part in the final test and nine evaluated the training. A full list of the training's participants is provided in Table 1. The training was held by Dr. Jens Kiesel with support by Lasha Sukhishvili. Internet, presentation equipment, desktop computers as well as drinks and snacks were provided through the National Seismic Monitoring Centre, Ilia State University. Training was held daily from 10:00 in the morning to 16:00-17:00 in the afternoon, with a 30-60min lunch break.

Table 1. Training participant's names and organization

<b>Name</b>	<b>Organization/position</b>	<b>Gender</b>
Zviad Ghadua	National Environmental Agency	M
Mikheil Nikuradze	National Environmental Agency	M
David Loladze	National Environmental Agency	M
Giorgi Merebashvili	Institute of Earth Sciences & NSMC, Ilia State University	M
Davit Tsiklauri	Institute of Earth Sciences & NSMC, Ilia State University	M
Givi Gventsadze	Institute of Earth Sciences & NSMC, Ilia State University	M
Soso Ukleba	Institute of Earth Sciences & NSMC, Ilia State University	M
Lasha Sukhishvili	Institute of Earth Sciences & NSMC, Ilia State University	M
Ioseb Kinkladze	National Environmental Agency	M
Tinatin Rostomashvili	Institute of Earth Sciences & NSMC, Ilia State University	F
Khatuna Kvlividze	Institute of Earth Sciences & NSMC, Ilia State University	F
Giorgi Tskhvediasvili	Ministry of Defence, DELTA	M
Mikheil Mitini	Ministry of Defence, DELTA	M
Iulia Bobrova	Institute of Earth Sciences & NSMC, Ilia State University	F
Avtandil Amiranashvili	Institute of Geophysics, Tbilisi State University. DELTA	M
Aleksandre Natsvlisvili	Emergency Management Agency, Ministry of Internal Affairs	M
Aleksandre Tsiskarauli	Emergency Management Agency, Ministry of Internal Affairs	M
Maia Batsatsashvili	N/A	F
Marina Kordzakhia	National Environmental Agency	F

During all days, care was taken to allow adequate time for questions, discussion and assessment of the results. All software, model relevant background literature, manuals, data, results and the presentations have been provided to all participants. The training was geared towards the understanding of all processes that were carried out to establish the hydrological model of the Leghvtakhevi. Throughout the training, the trainees were equipped with the required technology and knowledge to carry out the study in a similar catchment. All software and technology used is freely available. A detailed step-by step procedure to repeat the works as carried out in the training was supplied in a training handout (see Annex). Every training session was accompanied by a short presentation of the theoretical background and topics covered in the session.

The Training was split in two main parts. The first part, carried out in the first training week, began with an introduction in which the training objectives were outlined, including the usefulness, gaps and uncertainties of the study for decision-making (see Annex). The main component of part one was the data processing of temporal- and spatial data with a focus on dealing with the severe data gaps regarding precipitation and discharge data. Multiple institutions had interest in the radar data processing, for which a free software tool, developed as part of the project, was handed over to all trainees.

The second part, which has taken place in the second week, was focussing on the hydrological modelling and covered an introduction to HEC-HMS, sensitivity analysis, calibration and discussion of results. Emphasis was laid on the importance to select appropriate HEC-HMS simulation algorithms and to understand the major uncertainties involved in the modeller's decision and general model application.

The second part of the training was finalised by discussing questions and requests raised by the trainees which were supposed to aid them for their day-to-day work. Topics covered included gridded precipitation data input to HEC-HMS, the theory behind the TR55-Time of Concentration calculation, catchment characteristics influencing runoff processes, software for input data processing, a guideline of how to simulate complex catchments as well as free global data sources for regional modelling.

The training was closed with a summary and outlook presentation and discussion. A test was carried out to evaluate the trainees' knowledge gained. The test including the correct answers is provided in the Annex, while the distribution of the trainee's performance is given in Table 2. The trainees having achieved 15 or more points are considered to have passed the course successfully. All participants received a personal evaluation with their performance and correct answers. Finally, the participants were asked to evaluate the training program. Feedback was generally very positive (overall mark of the training: 1.0, where 1 represents very good and 5 unsatisfactory). The detailed evaluation results are presented in the Annex.

Table 2. Test evaluation with distinction of point classes and number of trainees within each class

Points	25-30	20-24	15-19	10-14	<10
Nr Trainees	2	1	4	1	0

### 3.2 Assessment and recommendations

The trainer assessed the course as successful. The technical equipment (hardware and software, internet access, projector) and training venue were very good. The atmosphere was very friendly, professional and cooperative. The trainees engaged in regular discussions and did not hesitate to ask questions. While the topics and work covered touched different themes and necessitated the in-depth use of multiple software packages, the trainees stayed motivated and completed all tasks and work as planned.

Recommendations to improve future trainings are:

- To make sure trainees are fully free from their usual working duties so that they are not targeted with requests from their day-to-day work throughout the training
- the supervisors should see the benefit of the training for their staff and make sure they can follow it undisturbed
- The training is organized in a way that the sessions and the knowledge gained builds on each other. It is hence best if the trainees take part in all sessions of the course and do not need to skip certain sessions

## 4 Hydraulic Modelling Training

### 4.1 Summary of training

The hydraulic modelling training took place at the Institute of Earth Sciences and National Seismic Monitoring Centre, Ilia State University from the 2<sup>nd</sup> July – 12<sup>th</sup> July 2018. In total 10 participants from four institutions were present during the training, of which six trainees took part in the final test and evaluated the training (in bold in the table below). A full list of the training's participants is provided in Table 3. The training was held by Mr. Juan Fernandez with support from Lasha Sukhishvili. Internet, presentation equipment, desktop computers as well as drinks and snacks were provided through the National Seismic Monitoring Centre, Ilia State University. Training was held daily from 10:00 in the morning to 16:00-17:00 in the afternoon, with a 30-60min lunch break.

Table 3. Training participant's names and organization

<b>Name</b>	<b>Organization/position</b>	<b>Gender</b>
<b>Zviad Ghadua</b>	National Environmental Agency	M
<b>Mikheil Nikuradze</b>	National Environmental Agency	M
<b>Giorgi Merebashvili</b>	Institute of Earth Sciences & NSMC, Ilia State University	M
Lasha Sukhishvili	Institute of Earth Sciences & NSMC, Ilia State University	M
<b>Ioseb Kinkladze</b>	National Environmental Agency	M
Tinatin Rostomashvili	Institute of Earth Sciences & NSMC, Ilia State University	F
Khatuna Kvlividze	Institute of Earth Sciences & NSMC, Ilia State University	F
Aleksandre Natsvlshvili	Emergency Management Agency, Ministry of Internal Affairs	M
Aleksandre Tsiskarauli	Emergency Management Agency, Ministry of Internal Affairs	M
Zurab Jikia	Universidade da Coruña	M
<b>Marina Kordzakhia</b>	National Environmental Agency	F
<b>Iulia Bobrova</b>	Institute of Earth Sciences & NSMC, Ilia State University	F

During all days, care was taken to allow adequate time for questions, discussion and assessment of the results. All software, models relevant background literature, manuals, data, results and the presentations were provided to all participants.

During the sessions, the trainees were confronted with the same issues the hydraulic modellers of the project have faced during the implementation of the model for the Leghvtakhevi River. It should be

noted that the implementation of this model has been extremely challenging, and due to the difficulty in the implementation, the modellers in HYDROC have had to change their modelling approach. As discussed in the “Report on Hydraulic modelling” (Deliverable 6), hydraulic modelling methodology was changed from 1D-2D to 2D because of the river peculiarities. The whole process was reproduced during the training and therefore this was deemed a very good example to use during the training. This is considered a very valuable experience for the implementation of future similar projects in Georgia.

Throughout the training, the trainees were equipped with the required technology and knowledge to carry out the study in a similar catchment. All software and technology used is freely available. A detailed step-by-step procedure to repeat the works carried out was supplied in a training handout (see Annex). Every training session was accompanied by a short presentation of the theoretical background and topics covered in the session.

The topics covered during the hydraulic modelling training were:

- Introduction to Hydraulic Modelling
- HEC-RAS 1D
- Structures in HEC-RAS 1D
- Introduction to 2D Modelling
- Advanced Modelling in 2D
- Introduction to 1D-2D Modelling
- Introduction to Hydraulic Forecasting
- Advanced Hydraulic Forecasting

All the training sessions had a theoretical presentation and then a practical session where the students had the chance to implement all the issues discussed during the theoretical sessions. It should be noted that specific attention was paid to the issues that a modeller may face during the implementation of a hydraulic model, including errors, spurious results and analysis of the output.

The training was closed with a summary and outlook presentation and discussion. A test was carried out to evaluate the trainees’ knowledge gained. The test including the correct answers is provided in the Annex, while the distribution of the trainee’s performance is given in Table 2. The trainees having achieved 15 or more points are considered to have passed the course successfully. All participants received a personal evaluation with their performance and correct answers. Finally, the participants were asked to evaluate the training program. Feedback was generally very positive (overall mark of

the training: 1.0, where 1 represents very good and 5 unsatisfactory). The detailed evaluation results are presented in the Annex.

Table 4. Test evaluation with distinction of point classes and number of trainees within each class

Points	25-30	20-24	15-19	10-14	<10
Nr Trainees	1	3	1	0	1

#### 4.2 Assessment and recommendations

The trainer assessed the course as successful. The technical equipment (hardware and software, internet access, projector) and training venue were very good. The atmosphere was very friendly, professional and cooperative. The trainees engaged in regular discussions and did not hesitate to ask questions. This is of significant importance for the trainer and to fulfil the actual objectives of the training and the technical assistance. The training was focused on the use of a particular software tool to address hydraulic models and flood risk management, but the discussions were centred in both the use of that particular software and in more general hydraulic modelling questions. The issue of flood forecasting was discussed at length too.

Recommendations to improve future trainings are:

- To make sure trainees are fully free from their usual working duties so that they are not targeted with requests from their day-to-day work throughout the training. It should be noted that this may be difficult to accomplish due to the shortage of qualified staff in Georgia in some institutions.
- To make sure trainees are fully aware of the training objectives.

It should be noted that during the training sessions a flood event occurred in western Georgia. This created grounds for intensive discussions on flood forecasting and on flood modelling for that particular area and in general.

## 5 Test

### 5.1 Hydrological Modelling test (with solutions)



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# Hydrological Modelling Training – Test

## Assessment of Suitable Flood Mitigation Measures (based on Dukniskhevi River Extreme Flood Analysis) in Tbilisi, Georgia

CTCN REFERENCE NUMBER: 2016000043

24<sup>th</sup> May 2018

Name: \_\_\_\_\_

1. If only rainfall observations are available, what type of models are needed to obtain inundated (flooded) area, e.g. for certain rain events? And in what order do they need to be applied? (2P)

Hydrologic model > Hydraulic model

2. Write down one major advantage or benefit of having a hydrologic or/and hydraulic model for your region of interest? (1P)

One of: Run scenarios, carry out engineering design, find the optimum between safety and costs

3. What types of flooding do you know and which one are we dealing with in the project? (2.5P)

Coastal flooding, pluvial flooding, [river- or flash floods]\*, dam breaks

4. On what characteristics does flooding in the Leghvtakhevi depend? (2.5P)

soil moisture, soil infiltration capacity, urbanization (impervious areas), river channel properties, rainfall intensity

5. What causes the highest uncertainties in our model application? (2P)

The disaggregation of the daily data to subdaily / the selection of the radar sub-daily event

6. What is USACE's software called to store, visualize and transfer model data between models (e.g. HEC-HMS to HEC-RAS)? (1P)

HEC-DSS

7. What were the major data problems (missing data) we were facing in the Leghvtakhevi? (3P)

Lack of: daily data at Kojori up to 2016, sub-daily gauged rainfall data, (sub-daily) observed discharge

8. In hydrological modelling, what rule of thumb can we use to select required modelling time steps? (2P)

Smaller than the time of concentration of the smallest subbasins

9. Why is it important to carry out subdaily simulations in the Leghvtakhevi – or what happens to the simulations if we only use daily time steps? (3P)

With daily time steps, peaks in the catchment cannot be simulated because the catchment reacts fast (<1hr) and is hence sensitive to shorter storm events

10. When extracting radar data for hydrologic modelling, why do we need to take care which slice (angle of the radar beam in vertical direction) we extract? (2P)

If the slice/angle is too low, the radar beam may be reflected at mountains (if the radar station is lower in elevation than the region of interest), if the slice/angle is too high, the radar beam is too high and may pass over the clouds, returning no reflectivity/rainfall

11. In HEC-HMS, why is the "Initial and Constant Loss" method superior to the "SCS-CN Loss" method? (2P)

The SCS-CN method always calculates the same ratio of loss per time step, while the Initial and constant loss method calculates a constant loss (based on the saturated hydraulic conductivity) and hence, the SCS-CN method is prone to underestimate the surface runoff from extreme events

12. What parameter did we use to calibrate the model in the Vere? (1P)

Saturated hydraulic conductivity

13. For how far is it safe to extent an observed time series to the recurrence interval (return period) – e.g. if you have a 33-year time period available, what return period should you derive at most? (1P)

Maximum 3 times the time series length (100year RP for a 33yr time series)

14. What efforts of data collection would have the highest benefit to improve the hydrological simulations in the Leghvtakhevi? (2P)

Sub-daily discharge observations and sub-daily gage-based rainfall observation

15. Which organization develops and maintains HEC-HMS? (1P)

USACE

16. List four advantages of HEC-HMS for our project (2P)

Focus on flood modelling, freely available, user friendly interface, flexible in terms of time steps and algorithms, could be used for early warning system due to continuous simulations, widely applied - user groups online available, link to HEC-RAS via HEC-DSS

Maximum: **30 Points**

## 5.2 Hydrological Modelling Training Evaluation results

1 = Strongly disagree	3 = neither agree nor disagree					5 = strongly agree					
2 = disagree	4 = agree					na = Not applicable					
	<b>Trainee</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>Av.</b>
<b>WORKSHOP CONTENT</b>											
I was well informed about the objectives of this workshop		5	5	3	5	5	5	5	5	5	<b>4.8</b>
This workshop lived up to my expectations		5	5	5	5	5	5	5	5	5	<b>5.0</b>
The content is relevant to my job		5	3	5	4	5	5	5	5	5	<b>4.7</b>
<b>WORKSHOP DESIGN</b>											
The workshop objectives were clear to me		5	5	5	4	5	5	5	5	5	<b>4.9</b>
The workshop activities stimulated my learning		5	5	5	5	5	5	5	5	5	<b>5.0</b>
The activities gave me sufficient practice and feedback		5	5	3	4	5	5	5	5	5	<b>4.7</b>
The difficulty level of this workshop was appropriate		5	5	5	3	5	5	5	5	5	<b>4.8</b>
The pace of this workshop was appropriate		5	5	5	5	5	5	5	5	5	<b>5.0</b>
<b>WORKSHOP INSTRUCTOR (FACILITATOR)</b>											
The instructor was well prepared		5	5	5	5	5	5	5	5	5	<b>5.0</b>
The instructor was helpful		5	5	5	5	5	5	5	5	5	<b>5.0</b>
<b>WORKSHOP RESULTS</b>											
I accomplished the objectives of this workshop		5	5	5	5	4	5	5	5	5	<b>4.9</b>
I will be able to use what I learned in my work		5	5	5	3	5	5	5	5	4	<b>4.7</b>
<b>SELF-PACED DELIVERY</b>											
The Workshop was a good way for me to learn this content		5	5	5	5	5	5	5	na	5	<b>5.0</b>
<b>WORKSHOP OVERALL MARK (1 VERY GOOD, 5 UNSATISFACTORY)</b>											
		<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1.0</b>
<b>How would you improve this workshop (check all that apply)</b>											
- Provide better information before the workshop											
<b>What would you like to learn in the future in the scope of disaster risk reduction, climate information and early warning systems?</b>											
- Development, establishment early warning systems platform (technical part)											
- Climate scenarios modelling, in particular downscaling climate models											
- Thresholds of various flood magnitude and hazard. Integrated real time (precipitation and discharge hourly gauge data) and radar data processing in the operational environment with probabilistic output of flooding in issuing or not issuing flash flood alerts.											
- R studio software											
- HEC-HMS in detail											
<b>Please provide any other feedback for the facilitator.</b>											
- All topics were presented in a very clear way. All questions emerged during the sessions were explained very well											
- I would like to thank Dr. Jens Kiesel for his effort to make the workshop materials more clear for each participants.											
- In my opinion, this training was very interesting and informative in all relevant issues, I would like to thank our trainer because this time we tried to learn more and visit his other workshops.											





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# Hydraulic Modelling Training – Test

## Assessment of Suitable Flood Mitigation Measures (based on Dukniskhevi River Extreme Flood Analysis) in Tbilisi, Georgia

CTCN REFERENCE NUMBER: 2016000043

11<sup>th</sup> July 2018

Name: \_\_\_\_\_

**1. What is the difference between hydrological and hydraulic modelling?**

A hydrological model converts meteorological data into runoff considering the hydrological conditions, whereas a hydraulic model routes that runoff and yields water level and discharge data at predefined locations.

**2. What is the difference between steady and unsteady modelling?**

In steady model the conditions of flow and stage do not change with time. In unsteady regime the conditions change with time. This is usually associated to the inclusion of a hydrograph.

**3. When would you use unsteady modelling?**

When storage is an issue. Also with areas with backwater effect, tides, very flat areas.

**4. What files do you need to include to run a hydraulic model in HEC-RAS?**

Geometry file, boundary condition file, plan file. Also terrain and projection information.

**5. Where do you include the information for any structure in the river channel?**

In the geometry file.

**6. How can you change the resistance in a 1D model?**

In the cross sections.

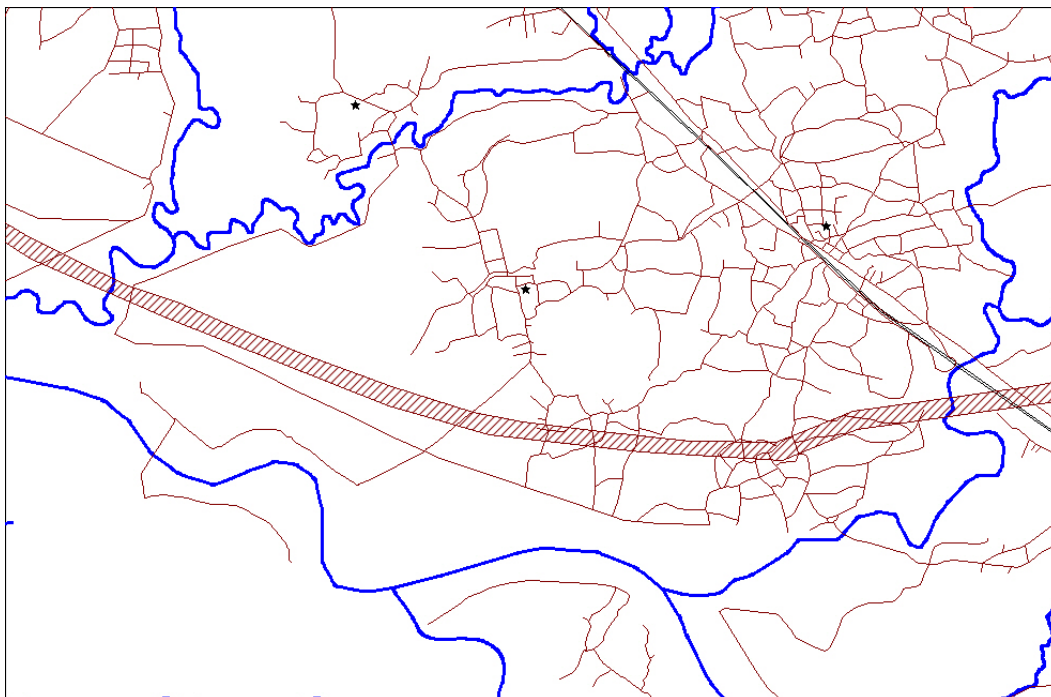
**7. How can you change the resistance in a 2D model?**

Either in the 2D Flow Area editor or in the RAS-Mapper land-cover file.

**8. What options do you think are available, from a modelling point of view, for flood mitigation?**

Culverts, dams, levees, storage, embankments...

**9. Imagine that the construction of a new road is planned following the brown polygon shown in the figure below in the lower Rioni.**



- How do you think a hydraulic model would help in this occasion

It would help to determine the impact of the road in the flow mechanism and also to determine if the road may get flooded. Ideally a hydraulic model should be used to reduce the impact the road may cause (adding sufficient hydraulic capacity for the road crossings).

- What modelling approach do you think it should be followed

2D, the road disturbs the whole flow mechanism crossing the floodplain area.

- What do you think should be the modelling domain

The whole area, and even extending it further DS because the area is really flat.

**10. What type of boundary conditions are available? What condition can you use in the US end?  
In the DS?**

Normal depth (DS), flow hydrograph (US), stage hydrograph (US, DS), known water stage (DS).

**11. You are trying to run a model and it is not working because it is too unstable. What can you  
change to increase the instability?**

Reduce time-step, increase hydraulic calculation tolerances, add additional cross sections, add minimum flow to avoid zero flows, add inline structures in locations with drastic changes in bed-level, check the flow regime and the Froude number (change to mixed or supercritical flow regime if necessary).

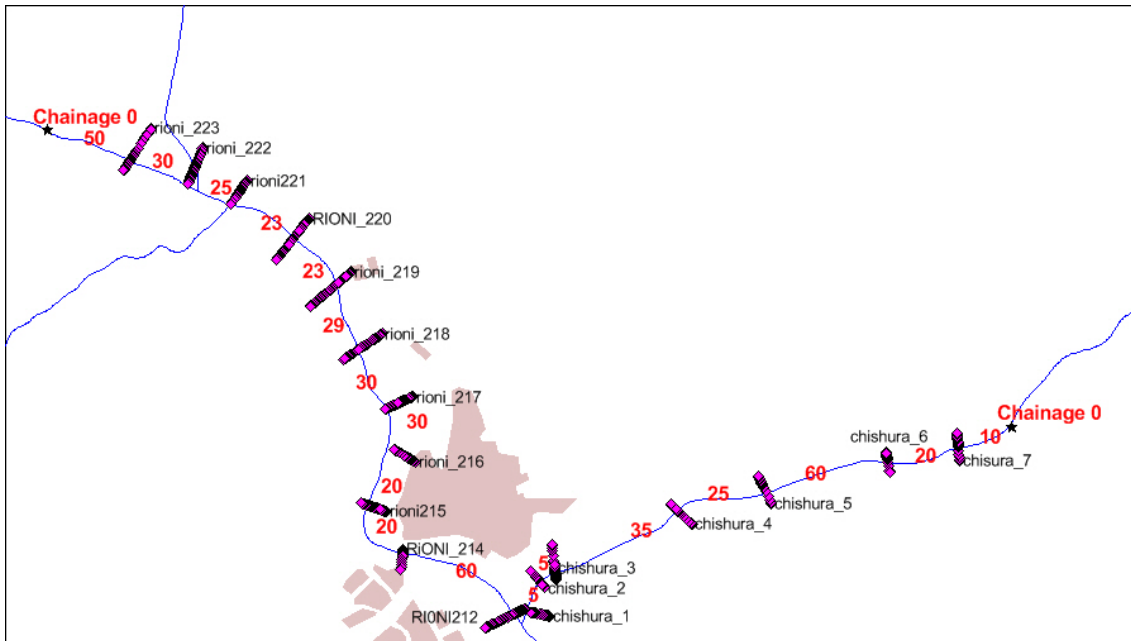
**12. You want to calibrate a model, and you are getting lower water levels in your model than in  
the observed data, what can you do?**

Mainly increase the resistance. Check also that the boundary condition values you have are correct. Also, when increasing the resistance check that this is justified and within the expected range

**13. When do you think it is a good idea to run a 2D model?**

When you have flat areas, when the floodplain flow is relevant, when you are considering urban flow, when 2D processes are important.

**14. Please consider the example below**



**How many boundary conditions would you need in the example below?**

Boundary Description	Boundary Type	Branch Name	Chainage
Rioni US	Flow Hydrograph	Rioni	0
Chishura US	Flow Hydrograph	Chishura	0
Rioni DS	Normal Depth	Rioni	212

**15. Please build a model with the following information.**

- River length 2000m
- One at chainage 2000 another one at chainage 0 and two interpolate ones at 600m and 1200m chainage. The cross section will have a trapezoidal shape, with a depth of 2 metres, a width of 2 metres in the bottom and 3 metres at the bank level. The slope between the chainage 2000 and 0 will be 1/100. The invert level in the upstream chainage will be 100m.
- Upstream boundary condition: discharge. Constant: 20m<sup>3</sup>/s
- Downstream boundary condition: water level. Constant: 1 metre above the invert level.
- Please write the following information

CS	Water Level	Discharge
2000	Various results	20
1200	Various results	20
600	Various results	20
0	Various results	20

**16. Why is the discharge always the same?**

Steady model

**17. What sensitivity tests can you carried out to assess the model stability?**

Change boundary condition DS, change resistance

**18. Was this a steady or unsteady model?**

Steady

**19. Please add a time series for an event of 24h duration and with the same peak flow. Are the water levels higher or lower than with constant flows? Why? Please show results in the table below.**

CS	Water Level Constant Flow	Water Level Time-series Flow
2000	Various results	Various results
1200	Various results	Various results
600	Various results	Various results
0	Various results	Various results

**20. What needs to be consider when implementing a flood forecasting system?**

Lead time, flood risk, information available, models available...

## 5.4 Hydraulic Modelling test (with solutions)

1 = Strongly disagree	3 = neither agree nor disagree			5 = strongly agree							
2 = disagree	4 = agree			na = Not applicable							
	<b>Trainee</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>Av.</b>
<b>WORKSHOP CONTENT</b>											
I was well informed about the objectives of this workshop		5	4	5	5	5	5				<b>4.8</b>
This workshop lived up to my expectations		5	4	5	5	5	5				<b>4.8</b>
The content is relevant to my job		5	3	5	5	5	5				<b>4.7</b>
<b>WORKSHOP DESIGN</b>											
The workshop objectives were clear to me		5	3	5	5	5	5				<b>4.7</b>
The workshop activities stimulated my learning		5	3	5	5	5	5				<b>4.7</b>
The activities gave me sufficient practice and feedback		4	3	5	5	5	5				<b>4.5</b>
The difficulty level of this workshop was appropriate		5	3	5	5	4	5				<b>4.5</b>
The pace of this workshop was appropriate		4	3	5	5	5	5				<b>4.5</b>
<b>WORKSHOP INSTRUCTOR (FACILITATOR)</b>											
The instructor was well prepared		5	4	5	5	5	5				<b>4.8</b>
The instructor was helpful		5	4	5	5	5	5				<b>4.8</b>
<b>WORKSHOP RESULTS</b>											
I accomplished the objectives of this workshop		5	3	4	5	5	5				<b>4.5</b>
I will be able to use what I learned in my work		5	3	4	5	5	5				<b>4.5</b>
<b>SELF-PACED DELIVERY</b>											
The Workshop was a good way for me to learn this content		5	3	5	5	5	5				<b>4.7</b>
<b>WORKSHOP OVERALL MARK (1 VERY GOOD, 5 UNSATISFACTORY)</b>											
		1	1	1	1	1	1				<b>1.0</b>
<b>How would you improve this workshop (check all that apply)</b>											
-Slow down the pace of the training											
-Allot more time for training											
-Add more video to the training											
-Clarify the training objectives											
-Speed up the pace of the training											
-Improve training organisation											
<b>What would you like to learn in the future in the scope of disaster risk reduction, climate information and early warning systems?</b>											
-Applying the hydrological and hydraulic modelling in the operational environment											
-More complicated model implementation											
-Learn more in HEC-RAS and FEWS and more practice											
<b>Please provide any other feedback for the facilitator.</b>											
-Thanks a lot for his great job											

## 6 Attendance Sheets

### 6.1 Hydrological Modelling Training

Assessment of Suitable Flood Mitigation Measures in Tbilisi, Georgia  
 Training in hydrologic modeling/List of participants

წყალდიდობის შემარბილებელი ღონისძიებების შემუშავება ქალაქ თბილისისთვის  
 ტრენინგი ჰიდროლოგიურ მოდელირებაში/მონაწილეთა სია

May 14-25, 2018/14-25 მაისი, 2018

No	Name/სახელი და გვარი	Organization/position/ორგანიზაცია/პოზიცია	Contact information/საკონტაქტო მონაცემები
1	Zurab Ghadua ზურაბ ჭავჭავაძე	NEA ვახუშტი ქვიციანი სააგენტო	ghadua@gmail.com +955 519 28 44 22
2	მისიელ ნიკიფორიძე	NEA ვახუშტი ქვიციანი სააგენტო	558-910-570
3	David Loladze	NEA National Environmental Ag.	591-40-10-85
4	გიორგი ჭავჭავაძე	ი.პ.ს. ს.ს. ქვეყნის ს.ს.	577-41-51-96
5	ლევან ნიკიფორიძე	ი.პ.ს. ს.ს. ქვეყნის ს.ს.	577-96-21-29
6	გიორგი ვახუშტი	ი.პ.ს. ს.ს. ქვეყნის ს.ს.	555 68 99 74

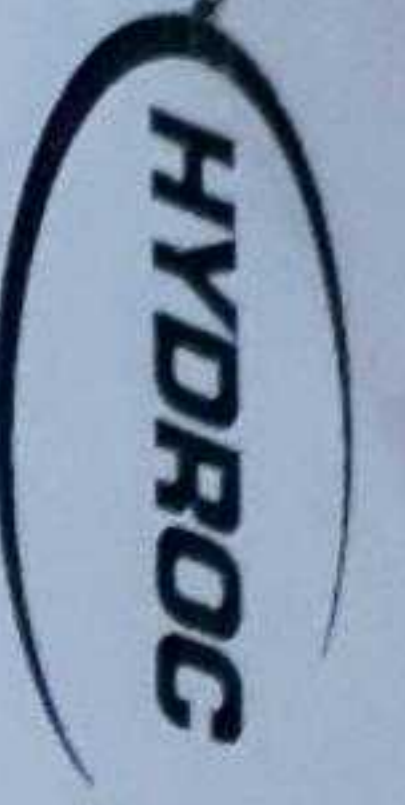
7	სამსახურის მფლობელი	სამსახურის მფლობელი	577601048
8	სამსახურის მფლობელი	სამსახურის მფლობელი	577493355
9	სამსახურის მფლობელი	სამსახურის მფლობელი	599525198
10	სამსახურის მფლობელი	სამსახურის მფლობელი	599-19-43-33
11	სამსახურის მფლობელი	სამსახურის მფლობელი	599 209620
12	სამსახურის მფლობელი	სამსახურის მფლობელი	593 99 19 17
13	სამსახურის მფლობელი	სამსახურის მფლობელი	599 62 70 58
14	სამსახურის მფლობელი	სამსახურის მფლობელი	557942291
15	სამსახურის მფლობელი	სამსახურის მფლობელი	595449326 avtandilemireanashvili@gmail.com
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18 მანა ზეგუბაძე  
19 მანა ზეგუბაძე

N/A  
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## 6.2 Hydraulic Modelling Training



### ჰიდრაველიკური მოდელირების ტრენინგი

პროექტი "წყალდიდობების შემარბილებელი ღონისძიებების შეფასება ქალაქ თბილისისთვის (მდინარე წავვისწყლის ექსტრემალური წყალდიდობის ანალიზის საფუძველზე)"

2-11.07.18

N	სახელი გვარი/Name	სამუშაო ადგილი, პოზიციის/Organization, position	ტელეფონი/Telephone	ელ-ფოსტა/e-mail	ხელმოწერა/Signature
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	გიორგი კოხაძე	საქართველოს სოციალისტური განმახიანებელი პარტია	577 600 888	g.koxashvili@gmail.com	
	იანა ციციანი	საქართველოს სოციალისტური განმახიანებელი პარტია	591 80 99 00	ianina.azelasba@gmail.com	



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საგანძვრო განყოფილება	საგანძვრო განყოფილება	533 209620	khafuna.kulividze @iliani.edu.ge	ს. გოგოლაძე
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საგანძვრო განყოფილება	საგანძვრო განყოფილება	577 541023	zarab.jikia@gmail.com	ს. გოგოლაძე
საგანძვრო განყოფილება	საგანძვრო განყოფილება	599 958824	natsulishvili@ni.edu.ge	ს. გოგოლაძე