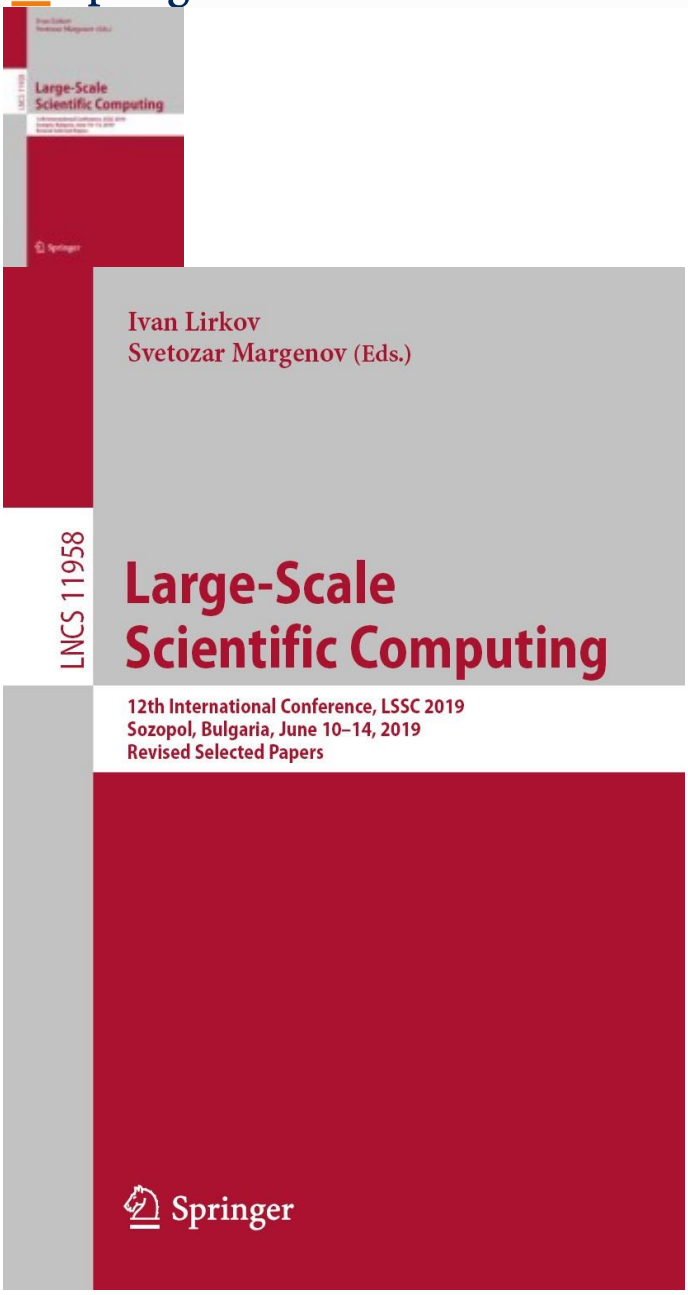

International Conference on Large-Scale Scientific Computing

LSSC 2019: **Large-Scale Scientific Computing** pp 300–308Cite as

Project for an Open Source GIS Tool for Visualization of Flood Risk Analysis After Mining Dam Failures

- Nina Dobrinkova,
- Alexander Arakelyan,
- Aghavni Harutyunyan &
- Sean Reynolds

- Conference paper
- First Online: 13 February 2020

Part of the Lecture Notes in Computer Science book series (LNTCS,volume 11958)

Abstract

Under DG ECHO funded project with acronym: ALTER there has been initiated an effort to support the Armenian Ministry of Emergency Situations in establishment of public-private partnerships to understand and address flood risks that may occur after mining dam failures. The project focus on three pilot areas where dams and other activities present risks to local communities: Akhtala and Teghut areas of Lori Marz along the Shamlugh river; the Vorotan Cascade and its associated dams in the Syunik region; and the Voghji river basin of Syunik region. In our article data collection, analysis and the results of dam break modelling for the Geghi reservoir and Geghanoush tailing dam located in Voghji river basin are presented. All collected data from hydro-meteorological sources, elevation, geologic, geomorphological and land use data have been processed in a way that Flood Hazard Index (FHI) Map of the studied area has been developed. This information is combined in GIS (Geographic Information System) layers. Those layers are being uploaded in specifically designed open source GIS tool in order to assist the end users on the field or in the operational room to rapidly assess the risks associated with flood occurred in a result of dam break and to better plan and visualize their activities.

Keywords

- **Dam break**
- **GIS**
- **Data collection and analysis**
- **Open source software**
- **Flood risk maps**

References

1. Georisk, C.J.S.C.: Assessment of the Multi-Component Risk Determined by the Maximum Seismic Impact on the Kapan City (Multi-Hazard City Scenario). Project ARM 10–0000005849, Final Report (2017)

   Google Scholar

2. Gevorgyan, A., Minasyan, R., Khondkaryan, V., Antonyan, A.: The Prediction of Possible Flooding of the Territory as a Result of the Accident of the Geghi Reservoir Dam (2014)

   Google Scholar

3. Wahl, T.L.: Dam breach modeling—an overview of analysis methods. In: Joint Federal Interagency Conference on Sedimentation and Hydrologic Modeling, Las Vegas, NV, 27 June–1 July 2010

   Google Scholar

4. Using HEC-RAS for Dam Break Studies. Compiled by Hydrologic Engineering Center of US Army Corps (2014)

   Google Scholar

5. Concha Larrauri, P., Lall, U.: Tailings dams failures: updated statistical model for discharge volume and runout. Environments **5**, 28 (2018)

CrossRef Google Scholar

6. Rico, M., Benito, G., Diez-Herrero, A.: Floods from tailings dam failures. J. Hazard. Mater. **154**, 79–87 (2008)

CrossRef Google Scholar

7. Schlaffer, S., Harutyunyan, A.: Working Paper: LCLU Voghji River Basin AUA Acopian Center for the Environment. AUA GIS and Remote Sensing Lab (2018)

Google Scholar

8. Froehlich, D.C.: Embankment dam breach parameters revisited. In: Proceeding of the First International Conference, Water Resources Engineering, Environmental and Water Resources Institute (EWRI), 14–18 August 1995, pp. 887–891. ASCE (1995)

Google Scholar

9. Froehlich, D.C.: Embankment dam breach parameters and their uncertainties. ASCE J. Hydraul. Eng. **134**(12), 1708–1721 (2008)

Google Scholar

10. MacDonald, T., Langridge-Monopolis, J.: Breaching characteristics of dam failures. J. Hydraul. Eng. **110**, 567–586 (1984)

CrossRef Google Scholar

11. Von Thun, J.L., Gillette, D.R.: Guidance on breach parameters. U.S. Bureau of Reclamation, Denver, CO, March 1990 (1990). 17 p. Unpublished internal document

Google Scholar

12. Xu, Y., Zhang, L.M.: Breaching Parameters for Earth and Rockfill Dams. ASCE J. Geotech. Geoenviron. Eng. **135**(12), 1957–1970 (2009)

Google Scholar

Download references

Acknowledgements

This paper has been supported partially by the Bulgarian National Science Fund project number DN 12/5 called: Efficient Stochastic Methods and Algorithms for Large-Scale Problems and the DG ECHO project called: "Alliance for disaster Risk Reduction in Armenia" with acronym: ALTER and Grand Number: 783214.

Author information

Authors and Affiliations

1. **Institute of Information and Communication Technologies, Bulgarian Academy of Sciences, Sofia, Bulgaria**
   Nina Dobrinkova
2. **Center for National Security and Defence Research, Bulgarian Academy of Sciences, Sofia, Bulgaria**
   Nina Dobrinkova
3. **AUA Center for Responsible Mining, American University of Armenia, Yerevan, Armenia**
   Alexander Arakelyan, Aghavni Harutyunyan & Sean Reynolds
4. **Institute of Geological Sciences of National Academy of Sciences, Yerevan, Armenia**
   Alexander Arakelyan

Corresponding author

Correspondence to Nina Dobrinkova .

Editor information

Editors and Affiliations

1. **Bulgarian Academy of Sciences, Sofia, Bulgaria**
   Dr. Ivan Lirkov
2. **Bulgarian Academy of Sciences, Sofia, Bulgaria**
   Prof. Svetozar Margenov

Rights and permissions

Copyright information

About this paper

Cite this paper

Dobrinkova, N., Arakelyan, A., Harutyunyan, A., Reynolds, S. (2020). Project for an Open Source GIS Tool for Visualization of Flood Risk Analysis After Mining Dam Failures. In: Lirkov, I., Margenov, S. (eds) Large-Scale Scientific Computing. LSSC 2019. Lecture Notes in Computer Science(), vol 11958. Springer, Cham. https://doi.org/10.1007/978-3-030-41032-2_34

- DOI
  https://doi.org/10.1007/978-3-030-41032-2_34
- Published13 February 2020
- Publisher Name Springer, Cham
- Print ISBN978-3-030-41031-5
- Online ISBN978-3-030-41032-2