

Eng. Mesfin Hagos Tewolde

Irrigation Engineer | Hydrologist | Civil Engineer | Water Resources Researcher



Eng. Mesfin Hagos Tewolde is a senior irrigation engineer, hydrologist and civil engineer whose career has developed across practical irrigation engineering, engineering hydrology, dams and reservoirs, hydraulic modelling, GIS and geomatics, academic research, international engineering practice and technical knowledge development. His work has combined field engineering with scientific investigation and modelling, giving him a professional perspective that

extends from the physical construction of water infrastructure to the analysis of catchments, rivers and hydraulic systems.

The HARE Irrigation Project

His connection with the **HARE Irrigation Project** reaches back to his undergraduate education at the Arba Minch Water Technology Institute in Ethiopia. There, while studying Civil / Irrigation Engineering, he worked with **Mitiku Bedru, Seid Shimelis and Tamir Mitiku** on the HARE Irrigation Project Design Report as their Bachelor of Science in Engineering graduation project.

The HARE study required the young engineering team to bring together several branches of irrigation and water-resources engineering within one integrated design exercise. Hydrology, crop-water requirements, irrigation planning, canal hydraulics, river diversion and hydraulic structures all had to be considered as parts of a single system. For Mesfin, this became an early

practical foundation for a career that would remain closely associated with water, irrigation, hydrology and hydraulic infrastructure.

Field Engineering in Irrigation and Dam Infrastructure

Shortly after completing his engineering studies, Eng. Mesfin entered professional practice as a construction engineer with SAERT in the Tigray Region of Ethiopia. His work on the Adigudem reservoir-fed surface-irrigation project gave him direct exposure to the construction and supervision of primary, secondary and tertiary canals together with numerous hydraulic structures. His responsibilities involved drop structures, gated turnouts, culverts, stilling basins, surveying, setting out, construction supervision and quality monitoring.

The Adigudem/Gumselasa scheme covered approximately 136 hectares and included primary, secondary and tertiary canals, about 400 concrete drop structures, numerous gated turnouts and water-distribution structures, three culverts, and two major drop structures with stilling basins. His responsibilities included surveying, setting out, structure positioning, quality monitoring and site supervision.

This early period was important because it placed the principles learned during his engineering education directly into the realities of field construction. Canal alignments, hydraulic structures, levels, dimensions, workmanship and water-control arrangements were no longer only matters of design calculation; they became physical works whose performance depended on careful setting out, construction quality and engineering supervision.

He subsequently worked with the Ministry of Agriculture in Eritrea, where his responsibilities continued to involve irrigation systems, earth canals, hydraulic structures, reservoirs and small-scale earth dams. These assignments strengthened his practical foundation in irrigation and dam engineering and gave him experience across both engineering design considerations and field implementation.

In Eritrea, this practical work also included involvement with the Halhal small-scale earth dam, including the dam body, spillway, outlet works and downstream filtration. From 2000 to 2002, he additionally served as a construction engineer on the Assab hospital project, broadening his civil-engineering experience through reinforced-concrete construction, quality control and construction-materials supervision.

Engineering Hydrology, Research and Publication

As his career developed, his professional interests moved increasingly towards **engineering hydrology**. Eng. Mesfin later completed a Master of Science degree in Hydrological Engineering at the University of KwaZulu-Natal in South Africa. His postgraduate research concentrated on flood routing in ungauged catchments using Muskingum methods, an area directly concerned with the behaviour and prediction of flood movement through river systems where observed hydrological information may be limited.

The research subsequently developed beyond the original MSc study. It resulted in a peer-reviewed scientific publication, conference contribution and a published technical book on flood routing in ungauged catchments using Muskingum methods. The book was later translated into seven widely spoken languages, making the research accessible to a broader international readership.

His research record also includes contributions to major Water Research Commission technical reports, including WRC Report No. 1318/1/07 on continuous-simulation modelling for design-flood estimation and WRC Report No. TT 391/08 on the integration and updating of SAPWAT and PLANWAT. He presented work on flood routing in ungauged catchments in Bonn, Germany, in 2005.

This phase of his career marked an important transition from predominantly field-based irrigation engineering towards scientific hydrological investigation, mathematical modelling and research publication. The underlying engineering concern nevertheless remained closely related to water: understanding how

runoff is generated, how flood waves travel through river systems and how hydrological behaviour can be represented using practical engineering methods.

Eng. Mesfin later worked as an assistant researcher at the University of KwaZulu-Natal and also as a research collaborator at the Central University of Technology in Bloemfontein. His work there included contributions to research on small-scale rainwater-harvesting technologies for Southern Africa. These experiences strengthened the research dimension of his professional profile and extended his work from conventional irrigation and river engineering into broader questions of water conservation and agricultural-water management.

GIS, Geomatics and Swiss Professional Development

His academic and professional development continued in Switzerland, where his work increasingly incorporated **hydrology, geomatics, GIS, photogrammetry, satellite imagery and spatial modelling**. At the University of Fribourg, he worked as a scientific collaborator and doctoral candidate in areas bringing together hydrological and geospatial methods.

He subsequently pursued advanced studies and professional training through Swiss institutions including HES-SO, the University of Geneva and EPFL. These studies covered areas such as geomatics, water management, GIS, urban planning, AutoCAD, Revit and related engineering subjects, broadening his ability to work across conventional civil engineering and modern spatial-analysis technologies.

His professional development also includes a six-month NRCS-sponsored water-management programme in 1997; GIS, ArcView and GPS training at the University of Bern in 1999; and later specialist training in 1D and 2D HEC-RAS, HEC-HMS, QGIS, WEAP, ArcSWAT, AutoCAD and Revit. A professional stage with CSD Ingénieurs SA in 2019 added practical BIM-oriented experience using Revit and related digital-design tools.

He also worked temporarily as a hydrologist for the Republic and Canton of Geneva. His assignment involved low-flow discharge analysis and hydraulic

modelling of the Aire River using HEC-RAS. The work brought together hydrological analysis and river-hydraulic modelling within the context of Swiss water-resources practice.

Integrated Engineering and Professional Recognition

Across these different stages, Eng. Mesfin has developed experience in surface, sprinkler and drip irrigation; canal hydraulics and water-control structures; small dams and reservoirs; engineering and design hydrology; flood routing and reservoir routing; river hydraulics; HEC-RAS and HEC-HMS modelling; catchment analysis; SWAT-based studies; GIS and remote sensing; flood mapping; construction supervision; and technical reporting.

His professional experience has therefore crossed several countries and several forms of engineering practice. Work in Ethiopia and Eritrea established a strong practical base in irrigation construction, hydraulic structures, reservoirs and small dams. South Africa strengthened his research and hydrological-modelling experience. Switzerland added further work in geomatics, spatial analysis, river hydraulics, professional engineering practice and continuing technical education.

Since 2014, he has also worked independently from Geneva in irrigation, hydrology and civil engineering, combining hydrological studies, flood routing, reservoir analysis, GIS-based assessment, technical documentation and the development of irrigation and water-resources knowledge products.

Eng. Mesfin is professionally recognised as a **European Engineer (EUR ING)** and as a **Mandataire Professionnellement Qualifié (MPQ)** in Geneva. He is also a member of the **Swiss Society of Engineers and Architects (SIA)**. His scientific and technical contributions include the book *Flood Routing in Ungauged Catchments using Muskingum Methods*, a peer-reviewed paper published in *Water SA*, contributions to Water Research Commission technical reports, and conference and seminar work in hydrology, irrigation, geomatics and water-resources engineering. He also maintains a professional expert

profile with the Swiss Academy of Sciences (SCNAT), reflecting his continuing professional engagement in hydrology and civil engineering.

Digital Water Innovation and Knowledge Leadership

An increasingly important dimension of his later work has been the application of engineering knowledge through **digital water innovation and professional knowledge sharing**. He has conceived and developed digital platforms supporting African water professionals, scientific water-data access, technical education and specialised water-sector information, together with hydrological-analysis tools and Android applications.

Among these initiatives are the African Water Experts professional database; AquaLinked Water Data, Water Lectures and Media; the Muskingum Flood Routing Studio; and two Android applications developed for mobile access to water-sector expertise and technical information. He has led this work from concept and system architecture through database development, deployment, hosting, content structuring, administration and continuous improvement.

This work represents a further development of the same professional interests that began with field engineering and hydrological research. Rather than limiting technical knowledge to reports, publications or individual projects, these initiatives seek to make engineering information, scientific data, professional expertise and technical learning resources more readily accessible to engineers, researchers, students and water-sector institutions.

Writing, Languages and Knowledge Communication

Alongside his technical development, Eng. Mesfin has pursued the study of the French language in Switzerland through institutions including the University of Fribourg, IFAGE in Geneva, the University of Geneva and the Programme CIUS de l'Université de Fribourg. This long engagement with French has supported his academic, professional and social integration in Switzerland and has also enabled him to publish for both English- and French-speaking readers.

His writing has not been limited to engineering. He is also the author of books addressing human experience, survival, exile, memory, adaptation and the rebuilding of life after adversity. Among these are *From Expendable to Escaped: A Journey of Survival – Eritrea: A Broken Dream Made Real*, *Twenty Winters in Silence*, and *A Journey of Exile and Hope: Building a New Life in Switzerland – Off the Beaten Path: Switzerland's Hidden Corners*, including works published in both English and French.

These literary works form a secondary but complementary dimension of his authorship. His technical publications seek to preserve and communicate engineering knowledge, while his non-technical writing records human experience across countries, cultures and periods of major personal change.

Returning to HARE: From 1995 to Modern Reassessment

The return to the **HARE Irrigation Project** after more than three decades gives this present book a particular significance in Eng. Mesfin's career.

Unlike an ordinary republication of an old student report, the present work allows the original engineering study to be seen again through the perspective of a professional life that subsequently passed through irrigation construction, dams, engineering hydrology, flood-routing research, catchment analysis, hydraulic modelling, GIS, geomatics and international professional practice.

In preparing the present HARE volume, Eng. Mesfin has also returned to the project with contemporary GIS and DEM-based methods. The modern reassessment includes renewed watershed and diversion-weir catchment delineation, drainage-network extraction, command-area mapping, elevation and percent-slope analysis, and comparison of the original 1995 engineering assumptions with present-day spatial evidence. This creates a direct technical bridge between the student design work and the experience accumulated over the decades that followed.

The calculations, assumptions, hydrological analyses, irrigation-design methods, hydraulic structures and engineering decisions made by the four

young students in 1995 can therefore be revisited with the benefit of accumulated professional experience and modern technical understanding.

For Eng. Mesfin, HARE is consequently both an early engineering work and a point of return.

The original report records the work of a young irrigation-engineering student learning to integrate hydrology, agriculture and hydraulic design. The present book is being prepared after decades spent working with many of those same subjects in considerably different professional environments.

Bringing the project back into print therefore connects engineering education with professional experience, and past calculations with present understanding. It preserves the original contribution of the four young engineers while also allowing the work to be carefully reviewed, clarified and presented for a new generation of engineers, researchers and students.

In that respect, HARE does not merely mark where Eng. Mesfin's engineering career began. Its re-examination decades later demonstrates something equally important: that engineering knowledge is never completely finished. It can be revisited, tested, refined and passed forward as experience grows.