

Toronto Workshop Report

Introduction

The IDFCC tool Toronto workshop was held at the Holiday Inn Toronto Airport, in Etobicoke, Ontario on October 17, 2014. A total of 27 individuals representing various municipalities, provincial and federal ministries, conservation authorities, financial institutions and private consulting firms registered for the event. Twenty-two participants attended the event.

The workshop was five hours in length, following roughly this schedule:

- 9:00-10:00 am: Background presentation
- 10:00-12:30 pm: Practical/hands-on portion
- 12:30 to 2:00 pm: Discussion session



Attendees

As provided in Table 1, a total of 22 attendees participated in the Toronto workshop. Participants represented several municipalities and government agencies, including the Regions of Peel and Halton, the Ontario Ministry of Environment and Climate Change, the Meteorological Service of Canada and the Hamilton, Central Lake Ontario and Ganaraska Region Conservation Authorities. The remaining attendees included staff from a number of private consulting firms and Intact Financial Corporation.

Table 1: Toronto, October 17, 2014 Workshop Attendees

Last Name	First Name	Title	Institution
Bastien	Jonathan	Water Resources Engineer	Hamilton Conservation Authority
Cunderlik	Juraj	Water Resources Engineer	CRA World
Dean	Nadeem	-	Region of Peel
Donevski	Harry	Infrastructure Tech.	Halton Region
Gadoury	Jonathan	Meteorologist	Intact Insurance
Huang	Li	Atmospheric Modeller	MOECC
Liu	John	Sr. Science Advisor on Climate Change	MOECC
Liu	Hong	Meteorologist	Dillon Consulting Ltd.
MacFarlane	Neil	Environmental Engineering Analyst	Central Lake Ontario CA
Mahoney	Trevor	Project Specialist	XCG Consultants Ltd.
McBrayne	Don	Water Resources Engineer	Associated Engineering
Morris	Bob	Meteorologist	Independent (retired from Environment Canada)
Mueller	Jessica	Watershed Hydrologist	Ganaraska Region CA
Rozanski	Rigel	Project Analyst	Greenland Consulting Engineers
Saha	Suman	Project Engineer	AJ Clarke & Associates
Senior	Matthew	Project Engineer	AMEC
Smith	Chris	Project Manager	Region of Peel
Tellez	Holman	Hydrologist	KGS GROUP
Yau	Ka-Hing	Meteorologist	Meteorological Service of Canada
Zhu	Hong	Specialist	Region of Peel
Lenarduzzi	Alex	Water Resources Specialist	Golder Associates Ltd.
Millington	Nick	Water Resources Engineer	C.C. Tatham & Associates

Workshop Outline

The workshop began with a one-hour presentation outlining the purpose of the workshop, providing background on the IDFCC tool methods and outlining the IDFCC tool. Participants were informed that the two primary purposes of the workshop were to receive practical user feedback on the draft version of the tool and to educate and inform potential users about the tool.

As part of the introductory presentation, participants were encouraged to focus on opportunities to improve practical aspects of the tool (e.g., identification of means to improve the user interface) during the workshop. However, discussion on the methodological background was welcomed, and there was a greater emphasis on the methodological background of the tool at the Toronto workshop than the previous workshop in Vancouver. Participants were also apprised of the background, context, objectives and status of the IDFCC tool project during the introductory presentation.

The bulk of the presentation focussed on the technical background and methods of the IDFCC tool. Topics covered in this portion of the presentation included a background to global climate modeling, a description of Representative Concentration Pathways (RCPs) and their role in climate modeling, a description of Global Climate Models (GCMs), GCM downscaling methods including methods used to downscale GCM data for the purposes

of generating IDF curves in the IDFCC tool, and methods used to generate skill scores for GCMs included in the IDFCC tool.

Users were also presented an outline of tool implementation, including an outline of the database, user interface and methods within the tool used to generate IDF curves. A brief outline of the user interface was also provided.

Working Session

The majority of the time of the workshop was allocated for the working session. After a brief introduction to the IDFCC tool user interface, workshop attendees were assigned a number of tasks to complete using the IDFCC tool. Participants were encouraged to complete the tasks on their own using the available user guide. Unlike the previous workshop (Oct. 9, Vancouver, BC), specific time allotments were not assigned to tasks during the working portion and participants were allowed to progress through the tasks at their own rate.

Tasks assigned to participants during the working portion included:

- Creation and activation of a user account;
- Exploring map functions;
- Selection of a pre-loaded Environment Canada (EC) rain station, and exploring its IDF curve based on historical data;
- Selection of a GCM and exploration of a climate-change impacted IDF curve;
- Generating a user-created station, and;
- Generating IDF curves for the user-created station.

During the working portion, project team members circulated through the room to answer question and record any difficulties users had with completing assigned tasks.

Discussion

A one-hour facilitated discussion was scheduled to allow users to identify and discuss practical issues identified during the working portion in a group setting. Each participant was encouraged to provide feedback in a systematic fashion. Participants were first encouraged to identify any practical issues they identified while using the tool, including issues surrounding the user interface. After a discussion of practical issues surrounding the use of the tool, a group discussion on tool methods and application of tool outputs was encouraged.

Workshop Results

Major themes of questions, discussion and comments provided by the workshop participants are summarized in Table 2. Table 2 also provides a count of the number of

times particular comments were raised during the workshop discussion and working session. Similar to the Vancouver workshop, participants at the Toronto workshop were encouraged to focus on practical aspects of the IDFCC tool, including opportunities to improve the user interface, increase the usability of outputs, and provision of relevant information to users. The majority of comments and questions received during both the hands-on and discussion session related to practical aspects of the tool.

As listed in Table 2, several comments related to increasing the usability of the tool and tool features, user-created rain stations, comparison of tool outputs and provision/accessibility of background information on tool methods were raised during the workshop. Participants were particularly interested in the ability of other users to edit user-supplied data and options related to display of user-created stations on maps (e.g., the provision of options to change user-created rain station icons). Users further indicated that more clarity was needed with regard to use of the Generalized Extreme Value (GEV) distribution for generation of future IDF curves (i.e., though GEV is provided as an option for IDF curves based on historical data, only the Gumbel distribution can be used when using the tool to generate future IDF curves). Some participants were also unsure about how to generate IDF curves for stations with partial data (e.g., stations missing data for 5 and 10 minute intervals) using the tool. One user also reported that options related to entering of user-supplied data (i.e., daily vs. yearly maximums) could be made clearer.

Table 2: Major Themes of Discussion and Comments

Theme	Topic	Comment, issue	n	
Practical considerations	Increase usability	List user-created stations alphabetically along with pre-loaded EC stations	1	
	Usability of tool features	Make it clear that GEV can't be used to generate IDF curves affected by climate change	1	
	User-created stations and user-inputted data	Where is user-entered data stored?		1
		Sharing of station data (who can view, edit data, etc.)		3
		Can you change the map icon for user-created stations?		3
		Generation of IDF curves for user-inputted stations with partial data		1
		Increase clarity of options for user-entered data		1
	Comparison of outputs – GCMs, RCPs, projection years	Incorporate uncertainties created by use of multiple GCMs		1
		Provide a function that allows exporting of numerical results to assist in comparison of outputs outside of tool		2
		Allow users to compare results from multiple GCMs, RCPs and projection years within the tool		4
	Accessibility of information on methods	What does the uncertainty range mean?		2
		Provide GCM skill scores, more information on skill score methods		3

Methods and tool design	GCM and RCP selection	Provide a function that allows running an ensemble of models	1
	Parameter estimations	Potential difficulty in comparing with historical EC IDF curves due application of method of l-moments	1
	General question(s)	What is the baseline for comparison of historical data with GCM data?	1
		Why does the tool apply method of l-moments?	1
		GCM data up to 2005, issues with ensuring that GCM inputs are up-to-date	1
Suggestions for future tool features	Spatial interpolation	Provide spatial interpolation function	2
Application of results		How to apply tool results	TGD*

*Topic of Group Discussion – the specific topic resulted in a group discussion, indicating a high level of interest in the comment or topic

Several comments were received with respect to the ability of users to compare results from multiple GCMs, RCPs and projection years. For example, one user indicated that the uncertainty range provided for future IDF curves should include uncertainties created by use of multiple GCMs, rather than only displaying uncertainty ranges associated with GCM runs and RCPs. Participants also requested an option in the tool that allows users to export numerical data for the purpose of comparison of results outside of the tool. However, several requests were made for the tool to provide the ability to compare results from multiple GCMs, RCPs and projection years directly within the tool—this appeared to be the preferred option based on comments made during the workshop.

Similar to the Vancouver workshop, several users requested more information on methods used to generate the GCM skill scores and indicated that it would be helpful if the tool listed skill scores beside GCM names in the list of GCMs provided to users for each rain station. Participants suggested that provision of skill scores within the IDFCC tool would help users select and apply multiple GCMs to generate and compare future IDF curves. Users also requested that the tool provide information within the user interface that describes how the uncertainty range is generated for future IDF curves, and what types of information are used to generate IDF curve uncertainty ranges (i.e., does the uncertainty range reflect application of various GCMs, or uncertainty within individual GCMs?).

Limited comments were received from users related to the background methodology used in the tool. One participant suggested that if the tool allowed for running of an ensemble of GCMs, it would help decrease user uncertainty associated with selection of individual GCMs. It was also suggested that the tool’s use of method of l-moments to fit extreme value distributions may create difficulties when comparing IDFCC tool-generated IDF curves with Environment Canada (EC) IDF curves. Difficulties may arise because EC applies method of moments in the development of IDF curves based on

historical rain station data, and the method of l-moments produces slightly different IDF curve statistics. Additional participant comments related to how data for specific rain stations is compared to GCM data (e.g., GCM data is available for the period 1850 to 2005, while individual rain stations may include data for different time periods, for example, 1950 to 2007), and why method of l-moments was selected for use in the tool.

Regarding capabilities that could be added to the tool in the future, participants suggested that a spatial interpolation function could be beneficial. This function would allow for the creation of IDF statistics for parts of the country that are not currently serviced by local rain stations. Similar to the Vancouver workshop, participants referred to the Ontario MTO IDF Curve Lookup Tool as an example of how this function may be provided.

Application of Results

Following the facilitated group discussion on practical issues related to the IDFCC tool, workshop participants were asked to comment on the potential use of the tool and application of results within their organizations. Attendees representing government agencies, including municipalities and conservation authorities, were specifically encouraged to comment on the usability of the tool within their professional practice.

A participant from a conservation authority (CA) indicated that municipalities within his CA's jurisdiction were all currently using different IDF curves for stormwater management system design, all of which were of varying age. The participant reported that the local upper-tier municipality was concurrently undertaking a climate change adaptation program. The participant reported that the IDFCC tool would be helpful in promoting the adoption of standardized IDF curves in local municipalities through the climate change adaptation program. The participant further reported that the tool would assist the CA in encouraging lower and upper-tier municipalities to adopt IDF curves that incorporate climate change impacts.

The participant further noted that the CA had implemented several new rain stations within its jurisdiction over the past 10-15 years. As many of these rain stations had not yet experienced extreme rainfall events, the participant expressed concern that data collected from the rain stations would result in the generation of IDF curves that do not accurately represent the potential for extreme events. However, incorporation of climate change impacts into IDF curves generated using relatively new rain station data could help communicate the potential for increasing frequency/severity of extreme precipitation events in the future.

Participants, notably CA staff and consultants, further indicated that they would likely use a number of IDFCC tool results associated with application of different GCMs to explore a range of climate change impacts on local IDF curves. These results could be incorporated into risk assessment processes applied at the local level.

Conclusion

Similar to findings of the Vancouver workshop, participants generally reported that the tool was very easy to use. At the same time, there was extensive discussion regarding application of tool results. During the discussion session, it was explained by members of the development team that multiple results produced through the tool associated with selection of various GCMs, RCPs and projection years should be considered as part of a risk assessment process. This was to clarify that the tool should not be used to produce a single result on which to base future design standards. This statement served to focus the discussion on application of results on how a range of results should be considered in infrastructure planning and design, and climate change adaptation.