Storm Networks Analysis During Extreme Hydrologic Events

Employing Computer Softwares in Modeling Networks’ Performance

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WHY We Should Take **More Frequent** Extreme Hydrology Events Into Consideration?

**SPM 1.4  Extreme events**

Changes in many extreme weather and climate events have been observed since about 1950. Some of these changes have been linked to human influences, including a decrease in cold temperature extremes, an increase in warm temperature extremes, an increase in extreme high sea levels and an *increase in the number of heavy precipitation events in a number of regions.* \(^{1.4}\)

Page 7, IPCC’s Climate Change 2014 Synthesis Report

**SPM 2.2  Projected changes in the climate system**

Surface temperature is projected to rise over the 21st century under all assessed emission scenarios. It is very likely that heat waves will occur more often and last longer, and that *extreme precipitation events will become more intense and frequent in many regions.* The ocean will continue to warm and acidify, and global mean sea level will rise. \(^{2.2}\)

Page 8, IPCC’s Climate Change 2014 Synthesis Report

“*More severe precipitation patterns associated with a warmer world are already showing up*”

Kevin Trenberth, senior scientist and head of the climate analysis section of the independent National Center for Atmospheric Research (NCAR) in Boulder, Colo.

PRO’s of Employing Softwares in Analysis

- Availability
  - Google Earth, Civil 3d, etc.

- Accuracy
  - Using Results in Planning & Decision Making

- Simplicity & Simulating Reality
  - Making Impression & Raising Awareness
Experience in Using Softwares

Sufficient Data

Reliable Results

Checking Existing Networks

Planning Networks for the Future

Decision Making, e.g. Climate Adaptation Plans
“Climate change is undeniable, It is happening and we have to do something about it. And this photo, I can say to all of you: Look at it.“ Said Kerstin Langenberger, a German national who works as a photographer and a conservationist who took this picture in Svalbard, Northern Norway and posted it on Facebook.
According to Mike Colledge, president of Canadian public affairs at Ipsos: “In developing countries, it’s really not an issue.”

Percentage of people, by country, who rank climate change as a top priority:

- Japan: 20%
- China*: 18%
- Australia: 16%
- Germany: 14%
- Canada: 13%
- Sweden: 12%
- USA: 12%
- India*: 12%
- Belgium: 10%
- Saudi Arabia*: 9%
- France: 8%
- Great Britain: 6%
- South Korea: 6%
- Mexico*: 5%
- Italy: 5%
- Russia*: 4%
- Spain: 4%
- Poland: 3%
- Argentina: 3%
- Turkey*: 3%
- Brazil*: 2%
- Hungary: 2%
- South Africa*: 2%

*Note that data for China, India, Saudi Arabia, Mexico, Russia, Turkey, Brazil and South Africa is not representative of the general population – just of highly educated, wealthier, often urban residents with internet access.
Main Softwares Used

AutoCAD Civil 3d 2012
Topography (From Google Earth) & Network Layout

Storm and Sanitary Analysis (SSA)
Design & Analysis According to Different Scenarios
AutoCAD Civil 3d 2012

Software’s Main Uses:

- Surveying
- Highways Design and Q.S.
- Storm and Sanitary Networks Layout
Google Earth and Civil 3d

A certain location’s Topography (elevations, contour lines, slopes...etc) in Google Earth

Import

AutoCAD Civil 3d
Modifications in the view of Surface’s Topography done in AutoCAD Civil 3d
Water Drop Command
A Storm Network Layout as Appears in AutoCAD Civil 3d
Storm and Sanitary Analysis (SSA)

Softwares Abilities Under Consideration

- Storm Networks Analysis
- Sanitary Networks Analysis
The IDF curves were created based on data from Consulting Engineering Center (CEC), IDF relation manual.
Table 2.4: GHG scenarios and the projected effect on precipitation and temperature per year on country level (TNC)

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<th>Minimum</th>
<th>Medium</th>
<th>Maximum</th>
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RCP 4.5

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RCP 8.5
An animation in the entire network using SSA during a specified storm
An animation in a pipe section using SSA during the specified storm
Flooded Network after Analysis by SSA Software
Conclusion

Softwares

A Tool for Planning and Decision Making

Impression
Thank You