Using Quick Scan methods for management of urban heat and flood risks or 'I don’t like models'.

Ir. F. (Floris) Boogaard, Professor at Hanze University of Applied Sciences Groningen (Netherlands) Floris@noorderruimte.nl

Trondheim, 5 February 2016

Who is Floris Boogaard?

Dutch direct: I don’t trust models

"EU": (quick scan) models have my greatest respect

Content

1. Why modelling heat and flooding?
2. Quick scan models
   1. Data needed
   2. urban heat
   3. flood risks
3. Verification and calibration
4. Getting things done: quick wins
5. Knowledge exchange (3D)
6. More info?

Challenges in urban areas

Examples of problems in urban areas: floodings, degradation of waterways, heat stress, drought leading to lower groundwater table and subsidence with results as damage of buildings

Why modelling heat stress?
**Why modelling floods?**

Floods in São Paolo/Brazil

- Saturday 2 January 2010
  - Deaths: >57

- Thursday 9 September 2011
  - Deaths: >2

- Friday 9 September 2011
  - Deaths: >432, (incl Rio de J)

- 10 January 2012
  - Deaths: >28

**Will it get better?**

No, so get quick insights on the problems

1. Why modelling heat and flooding?
2. Quick scan models
   1. Data needed
   2. urban heat
   3. flood risks
   3. Verification and calibration
   4. Getting things done: quick wins
   5. Knowledge exchange (3D)
   6. More info?

**Content**

**1. Why modelling heat and flooding?**

**2. Quick scan models**

   1. Data needed
   2. urban heat
   3. flood risks
   3. Verification and calibration
   4. Getting things done: quick wins
   5. Knowledge exchange (3D)
   6. More info?

**Quick scan models**

high level decision tools

What can we model?

- **Heat, flood**, drought, air pollution, subsidence, mobility, earthquakes…
- Combinations: stress testing, disaster risk mapping, ….

**Quick scan models**

high level decision tools

What data is needed model?

- GIS based, using:
  - DEM data (4 pt/m2)
  - Lidar
    - buildings
    - Green (trees/bush)
    - Paved areas
    - Water
    - Function of areas
    - Basic climate info (sun/shadow)
  - Measurements (N,Tair/PET)
  - Underground sewers?
Modelling extreme stormwater events
simplifications

Modelling sewers at extreme events?
Rubbish in is rubbish out

Modelling sewers calibration

Detailed modelling or quick scan?

Extremes and contribution of sewers

Content
1. Why modelling heat and flooding?
2. Quick scan models: disaster modelling
   1. Data needed
   2. urban heat
   3. flood risks
3. Verification and calibration
4. Getting things done: quick wins
5. Knowledge exchange
6. More info?
Case: Fire Chemie-Pack (Dutch chemical industry site) at Moerdijk

Location before and after the fire

Flow directions extinguishing water

Disaster Risk management mapping

Surface elevation level (DTM)

Accumulation of extinguishing
Stream tracks and vulnerable locations

From local scale to city scale

Groningen

Stresstest: flood and heatstress
3D model

1002 solutions for heatstress and floodings
Groningen: model verification

1950 → 2010

Could we predict this?

Impression of 3D

Groningen climate-proof Algemeen

3D flood and heatstress models

Hoogeveen WOLK 3D
Content

1. Why modelling heat and flooding?
2. Quick scan models
   1. Data needed
   2. urban heat
   3. flood risks
3. Verification and calibration
4. Getting things done: quick wins
5. Knowledge exchange (3D)
6. More info?
But does it work in other climates?
Some HUAS projects 2016-2020

<table>
<thead>
<tr>
<th>Country</th>
<th>Organisation</th>
<th>City</th>
<th>Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nederland</td>
<td>University of Applied Sciences Amsterdam</td>
<td>Amsterdam, Hoogeveen, Houten en Eindhoven</td>
<td>Raak onderzoek Klimaatbestendige Stad, inrichting in de praktijk</td>
</tr>
<tr>
<td>Nederland</td>
<td>University of Applied Sciences Rotterdam</td>
<td>Leeuwarden, Drachten, Delft, Rotterdam</td>
<td>Diverse projecten omtrent (beoordeling van) duurzame watersystemen oa met onderwater drones</td>
</tr>
<tr>
<td>Nederland</td>
<td>ministerie van Infrastructuur en Milieu</td>
<td>Hoogeveen, Meppel</td>
<td>Masterclasses kilmaatadaptatie</td>
</tr>
<tr>
<td>Nederland</td>
<td>STOWA</td>
<td>Diverse (inter)nationale steden en regio's</td>
<td>Implementatie en actualisatie <a href="http://www.climatescan.nl">www.climatescan.nl</a></td>
</tr>
<tr>
<td>Noorwegen</td>
<td>Norwegian University of Science and Technology (NTNU), University of Applied and The Geological Survey of Norway (NGU)</td>
<td>Oslo/Trondheim/Bergen</td>
<td>&quot;INnovations for eXtreme Climatic eventS&quot; &quot;INXCES&quot;</td>
</tr>
<tr>
<td>Zweden</td>
<td>Luleå University of Technology (LTU)</td>
<td>Luleå</td>
<td>&quot;INnovations for eXtreme Climatic eventS&quot; &quot;INXCES&quot;</td>
</tr>
<tr>
<td>Roemenië</td>
<td>Technical University of Civil Engineering of Bucharest</td>
<td>Bucharest</td>
<td>&quot;INnovations for eXtreme Climatic eventS&quot; &quot;INXCES&quot;</td>
</tr>
<tr>
<td>Duitsland</td>
<td>Oldenburgisch-Ostfriesische Wasserverband</td>
<td>Brake</td>
<td>Water Co-Governance for sustainable ecosystems</td>
</tr>
<tr>
<td>Zweden</td>
<td>Havs- och vattenmyndigheten en Vattenmyndigheten Västerhavets vattendistrikt</td>
<td>Gothenburg</td>
<td>Water Co-Governance for sustainable ecosystems</td>
</tr>
<tr>
<td>Denemarken</td>
<td>SEGES Kommunernes Landsforening</td>
<td>Aarhus, Kopenhagen</td>
<td>Water Co-Governance for sustainable ecosystems</td>
</tr>
<tr>
<td>Engeland</td>
<td>The Rivers Trust</td>
<td>Callington</td>
<td>Water Co-Governance for sustainable ecosystems</td>
</tr>
</tbody>
</table>

From Groningen to Taiwan other climates….

Netherlands vs Taiwan

Comparable landsize Urbanisation in the west
Sorry, but does this model represent real temperatures and stress?

measurements

measures and measurements
heatstress

Content
1. Why modelling heat and flooding?
2. Quick scan models
   1. Data needed
   2. urban heat
   3. flood risks
3. Verification and calibration
4. Getting things done: quick wins (international)
5. Knowledge exchange (3D)
6. More info?

Examples extreme flooding
RIO

Europe vb Copenhagen

Flooding visualized
**Place? Climate city approach**

Multifunctional and space for water

- Mapping flooding/heatstress
- Buildings
  - Roofs
  - Green buildings
- Squares
  - Open areas
  - Playgrounds
- Roads
  - Road surface
  - Road storage
  - Near roads
- Green
  - Parcs
  - Little green

**Copenhagen: Use existing infrastructure**

**Examples extreme floodings**

Bergen Norway

More to come: “INnovations for eXtreme Climatic eventS”

“INXCES”

**Visit Holland**

www.climatescan.nl

You are welcome

**Content**

1. Why modelling heat and flooding?
2. Quick scan models
   1. Data needed
   2. Urban heat
   3. Flood risks
3. Verification and calibration
4. Getting things done: quick wins
5. Knowledge exchange
6. More info?

**tools: research participation**

Meetings, fieldtrips, interviews, courses, seminars, job rotation, augmented reality, serious gaming, ...
Example WaterTown

- WaterBurgh – integrated planning
- Wetley-Tetley – Pluvial flooding
- Egmond – political decisions
- Bryggen – settlement of historic buildings

Flooding Egmond aan Zee
Augustus 2006: 60mm/h

A story and solutions to share

- budget
- >20 solutions
  - Dimensions
  - Cost
  - Experience
  - Do’s and don’ts
- bloody nose game

101 solutions in Watertown

If roads flood, use that

Use road infrastructure ‘sleeping policeman’
Conclusions

1. I don’t like models but I need quick scan methods with strong visualization for disaster modelling/stresstesting
2. Quick scan models
   1. Limited data needed
   2. Examples: urban heat, flood risks (and more)
3. Verification and calibration is needed
4. Participation: getting things done
   1. Quick wins
   2. Knowledge exchange (3D)
5. More info? www.climatescan.nl

Content

1. Why modelling heat and flooding?
2. Quick scan models
   1. Data needed
   2. Urban heat
   3. Flood risks
3. Verification and calibration
4. Getting things done: quick wins
5. Knowledge exchange
6. More info?

Floodmodel for planning
Amsterdam: prioritize

Floodmodel for planning
Amsterdam: prioritize

Gemeten neerslag weerstation gemeente Diemen

Bui april-2009
Bui mei-2009
Bui 8
Bui 9
Bui 10

tijd (5 min vakken)
neerslag mm/h