FEMA FACT SHEET

DSS-WISE™ HCOM: Human Consequences of Dam-Break Floods

Decision Support System for Water Infrastructure Security Human Consequence Module (DSS-WISE™ HCOM) is an analytical module for automated assessment of the human consequences of dam-break floods. The National Center for Computational Hydroscience and Engineering (NCCHE) and the University of Mississippi developed the module with funding provided by the U.S. Federal Emergency Management Agency (FEMA) through a contract with Argonne National Laboratory.

Using DSS-WISE™ HCOM

DSS-WISE™ HCOM is accessible 24/7 to registered users from FEMA, federal agencies and state dam safety offices via the web portal. DSS-WISE™ Web, https://dsswiseweb.ncche.olemiss.edu/.

DSS-WISE™ HCOM Analysis

DSS-WISE™ HCOM uses the results of flood simulation using DSS-WISE™ Lite to provide maps of:

- Flood hazard risk for people caught outdoors and indoors.
- Potentially lethal flood zones (PLFZ) for children and adults.

DSS-WISE™ HCOM also provides analysis of People at Risk (PAR) by interfacing the results of flood simulation using DSS-WISE™ Lite with the population data sets:

- 2010 census block data from U.S. Census Bureau, and
- LandScanUSA gridded nighttime and daytime population data from Oak Ridge National Laboratory (ORNL).

$q_{max} \equiv DV_{max}$				Potential Hazard (or Danger) Category	Explanation based on Cox et al. (2010)		
(m^2/s)		(ft^2/s)			Adults	Children	Infants, Small Children and Frail/Older Persons
from	to	from	to				
0.0	0.4	0.0	4.3	Very Low Hazard: Shallow flow or deep standing water	Low Hazard	Low Hazard	Extreme Hazard Dangerous to all Infants, Small Children and Frail/Older Persons
0.4	0.6	4.3	6.5	Low Hazard: Dangerous to Children		Significant Hazard; Dangerous to most children	
0.6	0.8[2]	6.5	8.7[2]	Moderate Hazard: Dangerous to some adults	Moderate Hazard: Dangerous to some adults	Extreme Hazard: Dangerous to all children	
0.8	1.2[3]	8.7	13.0[3]	Significant Hazard: Dangerous to most adults	Significant Hazard: Dangerous to most adults		
1.2[3]		13.0[3]		Extreme Hazard: Dangerous to all	Extreme Hazard: Dangerous to all		

1) Small children, children and adult categories are defined based on height (H) time mass (M)
Small children: H×M ≤ 25 (m.kg) H×M ≤ 181 (ft.Lb)
Children: 25 < H×M (m.kg) ≤ 50 181 < H×M (m.kg) ≤ 362
Adult: 50 < H×M (m.kg) 362 < H×M (ft.Lb)

2) Recommended upper limit of tolerable working flow regime for trained safety workers or experienced and well-equipped persons

3) Above this value, the hazard is extreme according to majority of the past studies.

Flood Hazard Mapping

A flood hazard map partitions the inundation area into zones of potential danger classes defined in terms of intervals of a product of depth D and velocity V (DV).

$q_{max} \equiv DV_{max}$		Color Code	Building Type
(m^2/s)	(ft^2/s)		
≥ 5	≥ 54		Poorly constructed building
≥ 10	≥ 108		Well-built timber building
≥ 15	≥ 162		Well-built masonry building
≥ 20	≥ 215		Concrete building
≥ 35	≥ 377		Large concrete building

For *people caught outdoors*, selected ranges of DV-values define 5 potential danger classes with representing danger levels for different population categories.

For *people caught indoors*, the potential danger is associated with the collapse of the building. DSS-WISE™ HCOM identifies 5 potential danger zones corresponding to collapse limits of different building types.

FEMA

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The University of Mississippi

Potentially Lethal Flood Zones

Potentially lethal flood zones are defined based on the maximum flood depth and maximum DV-value.

DSS-WISE™ HCOM extracts and maps the polygons corresponding to PLFZ zones for children and adults listed (first two rows).

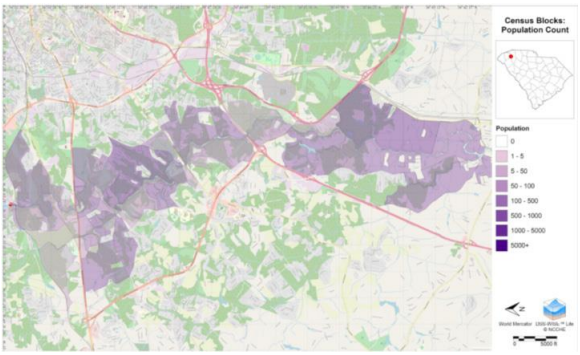
Category	$h_{max} \equiv D_{max}$ (ft.)		$q_{max} \equiv DV_{max}$ (ft²/s)
Children caught outdoors (tent camping, fishing, hiking, etc.)	≥ 2	OR	≥ 5.4
Adults caught outdoors (tent camping, fishing, hiking, etc.)	≥ 4	OR	≥ 6.5
Motor vehicle (compact car) floating	≥ 1	OR	≥ 4.3
Motor vehicle (compact car) sliding/toppling			≥ 5.4
Mobile homes	≥ 2	OR	≥ 30
Typical residential structures	≥ 4	OR	≥ 75

PAR Analysis Using Census Blocks

DSS-WISE™ HCOM extracts the list of census blocks that are completely or partially inundated. The results are presented both as a polygon shapefile and a spreadsheet table.

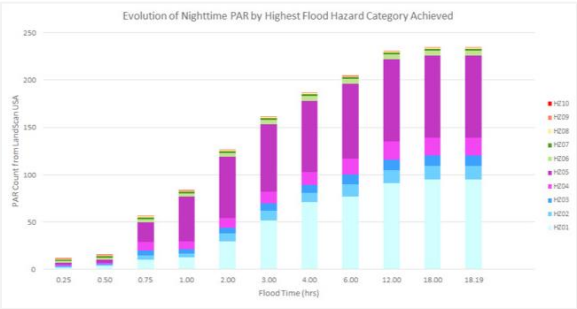
Attributes for each census block include:

- 2010 total housing count
- 2010 total population count
- Total area of the census block
- Inundated area of the census block
- Percent area inundated
- Flood arrival time
- Maximum flood depth
- Maximum DV
- Arrival time of maximum DV



Nighttime/Daytime PAR Analysis

Nighttime and daytime PAR analysis is performed using gridded LandScanUSA data developed by the ORNL by assigning population counts to the grid cells with a 3 arcsecond (~90 m) resolution. DSS-WISE™ HCOM provides tables and corresponding plots of the evolution of inundation area, and the nighttime and daytime PAR classified in 10 intervals of maximum DV.



Flood Time	Nighttime PAR by Highest Flood Hazard Category Achieved										Total
(hrs)	HZ01	HZ02	HZ03	HZ04	HZ05	HZ06	HZ07	HZ08	HZ09	HZ10	NT PAR
0.25	2	1	1	1	2	2	1	1	1	0	12
0.50	4	1	1	1	3	2	2	1	1	0	16
0.75	10	5	5	9	21	3	2	1	1	0	57
1.00	13	4	4	9	47	3	2	1	1	0	84
2.00	30	8	6	10	65	4	2	1	1	0	127
3.00	52	10	8	12	71	5	2	1	1	0	162
4.00	71	10	8	14	75	5	2	1	1	0	187
6.00	77	13	10	17	79	5	2	1	1	0	205
12.00	91	14	11	19	87	5	2	1	1	0	231
18.00	95	14	11	19	87	5	2	1	1	0	235
18.19	95	14	11	19	87	5	2	1	1	0	235

Benefits of DSS-WISE™ HCOM

DSS-WISE™ HCOM produces a PDF Final Report, an MS Excel worksheet with tabular data, and a series of geospatial files The results are used for Emergency Action Plan (EAP) preparation, better preparedness, emergency response planning, and evacuation planning, etc.