

Displaced Households (Hazus v2.1)

The following inputs are required to compute the number of uninhabitable dwelling units and the number of displaced households. The total number of units or households is provided in the default inventory based on census data (Section 3.6.2 of Chapter 3). The user can modify any values based on improved information.

Total Number of Single-Family Dwelling Units (#SFU) Total Number of Multi-Family Dwelling Units (#MFU) Total Number of Households (#HH) Damage state probability for moderate structural damage in the single-family residential occupancy class (%SFM).

- Damage state probability for extensive structural damage state in the single-family residential occupancy class (%SFE).
- Damage state probability for complete structural damage state in the single-family residential occupancy class (%SFC).
- Damage state probability for moderate structural damage state in the multi-family residential occupancy class (%MFM).
- Damage state probability for extensive structural damage state in the multi-family residential occupancy class (%MFE).
- Damage state probability for complete structural damage state in the multi-family residential occupancy class (%MFC).

[Note: The probabilities %SFM, %SFE, %SFC, %MFM, %MFE, and %MFC are provided by the Direct Physical Damage Module - Buildings (Chapter 5)].

14.2.2 Description of Methodology The estimated number of uninhabitable dwelling units is calculated by combining a) the number of uninhabitable dwelling units due to actual structural damage, and b) the number of damaged units that are perceived to be uninhabitable by their occupants. Based on comparisons with previous work (Perkins, 1992; Perkins and Harrauld, et. al., unpublished), the methodology considers all dwelling units located in buildings that are in the complete damage state to be uninhabitable. In addition, dwelling units that are in moderately and extensively damaged multifamily structures are also considered to be uninhabitable due to the fact that renters perceive some moderately damaged rental property as uninhabitable. On the other hand, those living in single-family homes are much more likely to tolerate damage and continue to live in their home. By applying an occupancy rate (households vs. dwelling units), the total number of displaced households (#DH) is calculated by the following relationship.

$$\begin{aligned} \%SF &= w_{SFM} \times \%SFM + w_{SFE} \times \%SFE + w_{SFC} \times \%SFC \\ \%MF &= w_{MFM} \times \%MFM + w_{MFE} \times \%MFE + w_{MFC} \times \%MFC \end{aligned} \quad (14-1)$$

$$\#DH = (\#SFU \times \%SF + \#MFU \times \%MF) \times \left(\frac{\#HH}{\#SFU + \#MFU} \right)$$

The values in Table 14.1 are provided as defaults. Due to the subjective nature of perceptions, users may want to change these values¹.

Table 14.1: Default Values for Damage State Probabilities

Weight Factor	Default Value
w_{SFM}	0.0
w_{SFE}	0.0
w_{SFC}	1.0
w_{MFM}	0.0
w_{MFE}	0.9
w_{MFC}	1.0

Short-Term Shelter Needs (Hazus v2.1)

14.3 Short Term Shelter Needs - Form of Loss Estimate

All households living in uninhabitable dwellings will seek alternative shelter. Many will stay with friends and relatives or in the family car. Some will stay in public shelters provided by the Red Cross or others, or rent motel or apartment lodging. This methodology estimates the number of displaced persons seeking public shelter. In addition, observations from past disasters show that approximately 80% of the pre-disaster homeless will seek public shelter. Finally, data from Northridge indicates that approximately one-third of those in public shelters came from residences with little or no structural damage. Depending on the degree to which infrastructure damage is incorporated into #DH, that number of displaced persons could be increased by up to 50% to account for "perceived" structural damage as well as lack of water and power.

14.3.1 Input Requirements - Short-Term Shelter Needs

The inputs required to estimate short-term housing needs are obtained from the displaced household calculations in Section 14.2 and from the default census data. As with the entire methodology, the census data can be modified with improved user information. The inputs listed below are the required census data inputs.

14.3.2 Description of Methodology

Those seeking public shelter can be estimated from experience in past disasters, including both hurricanes and earthquakes. Those seeking shelter typically have very low incomes, for these families have fewer options. In addition, they tend to have young children or are over 65. Finally, even given similar incomes, Hispanic populations from Central America and Mexico tend to be more concerned about reoccupying buildings than other groups. This tendency appears to be because of the fear of collapsed buildings instilled from past disastrous Latin American earthquakes.

The number of people who require short-term housing can be calculated using the following relationship.

$$\#STP = \sum_{i=1}^5 \sum_{j=1}^2 \sum_{k=1}^3 \left(\alpha_{ijk} \times \left(\frac{\#DH \times POP}{\#HH} \right) \times HI_i \times HE_j \times HO_k \times HA_l \right) \quad (14-2)$$

Note: Methodology has been adapted to Canadian context

Class	Description	Variable/Weighting Factor
POP	Nighttime population in Census Dissemination Area	NightPop
#HH	Number of households in Census Dissemination Area	Households
#DH	Number of displaced Households in Census Dissemination Area	Hshld
P_DU	Average Number of People per dwelling	
Households		
W_SFM	Moderate damage state for Single-Family residence	0
W_SFE	Extensive damage state for Single-Family residence	0
W_SFC	Complete damage state for Single-Family residence	1
W_MFM	Moderate damage state for Single-Family residence	0
W_MFE	Extensive damage state for Single-Family residence	0.9
W_MFC	Complete damage state for Single-Family residence	1
Income		
IM1	Household Income < \$15,000 CAD	0.62
IM2	\$15,000 < Household Income < \$20,000	0.42
IM3	\$20,000 < Household Income < \$35,000	0.29
IM4	\$35,000 < Household Income < \$50,000	0.22
IM5	\$50,000 < Household Income	0.13
Demographic		
EM1	Imm_LT5	0.24
EM2	Live_Alone	0.48
EM3	No_EngFr	0.47
EM4	LonePar3Kids	0.26
EM5	Indigenous	0.26
Ownership		
OM1	Own Dwelling Unit	0.40
OM2	Rent Dwelling Unit	0.40
Age		
AM1	Age_GT65	0.40
AM2	AG_LT6	0.40