

Hazus Starter Kit Part 5: Demographic Inventory

March 20, 2013



Natural Resources
Canada

Ressources naturelles
Canada

Canada

Starter Kit Concept

- Provide resources to help set up and start the use of Hazus Canada.
- Provide overviews and demonstrations of the necessary steps to set up Hazus and start using Hazus.
- Do these things through the CanHUG meetings and accessible websites.



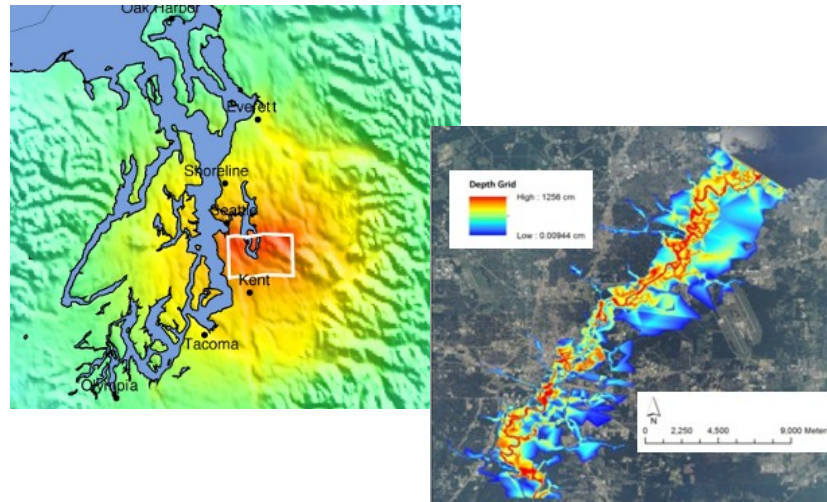
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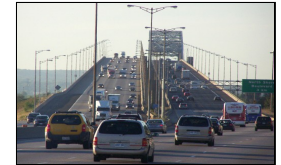
Natural Resources
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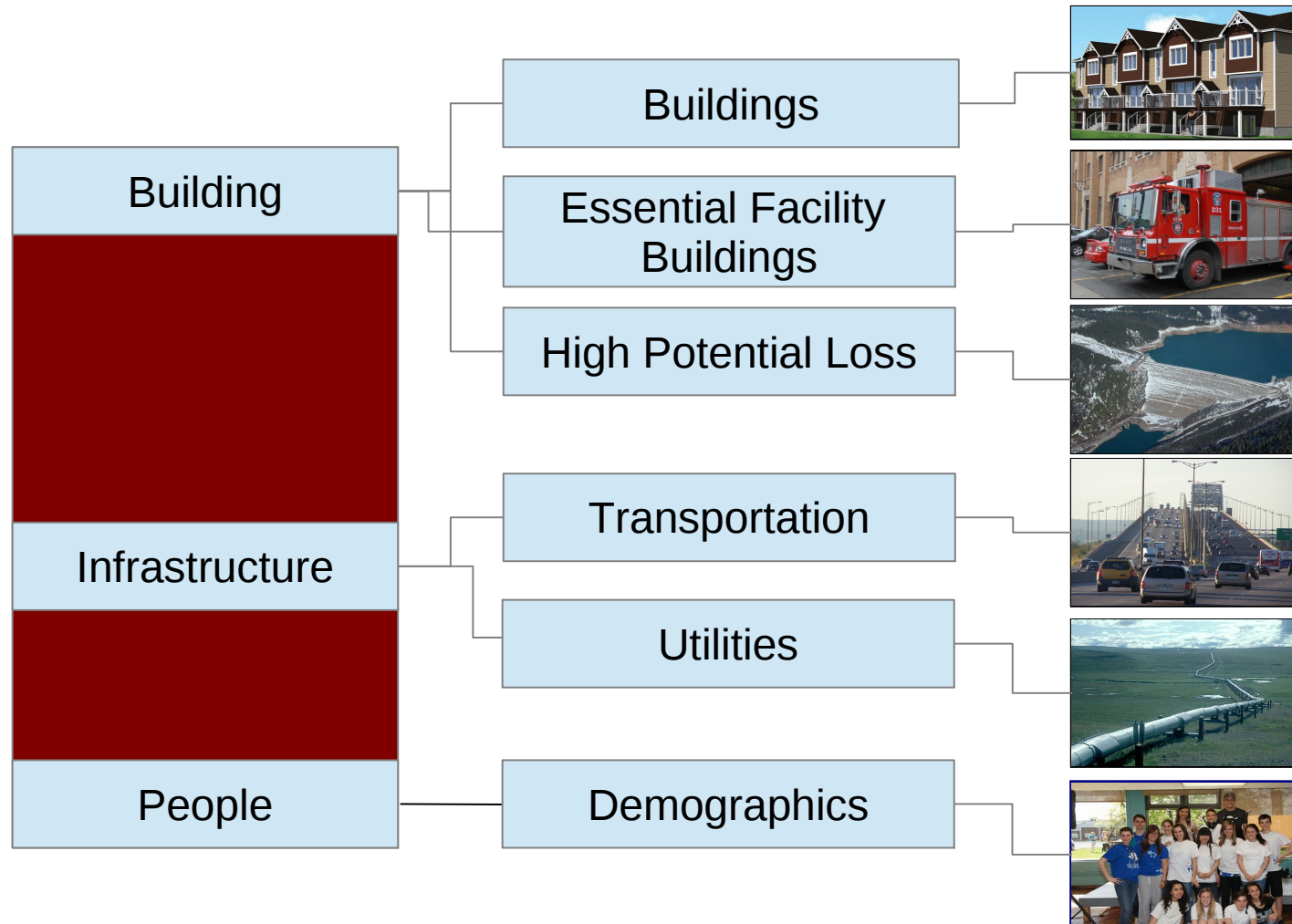
Hazus Inputs



- Part 1: Starter kit concept
- Part 2: Hazard scenarios
- Part 3: Assets - Building stock
- Part 4: Assets - Infrastructure and other
- Part 5: Assets - Demographics

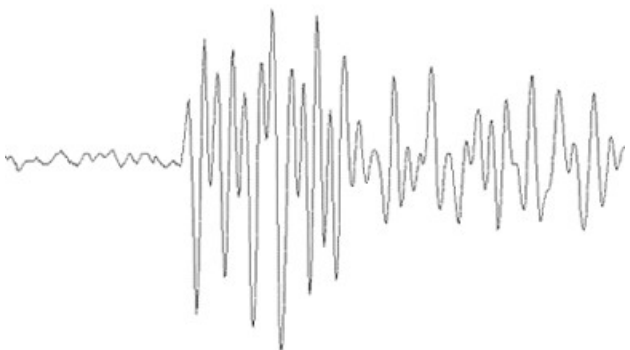


Asset Inventory

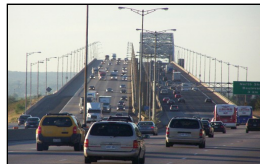


Asset Inventory

Why you need it



Hazard event



Assets



Consequence Losses



Demographics Inventory

Works in conjunction with occupancy data to determine injuries, deaths, displaced households, and shelter requirements



People
1 of 40 categories



Occupancy Class
1 of 33 for earthquakes



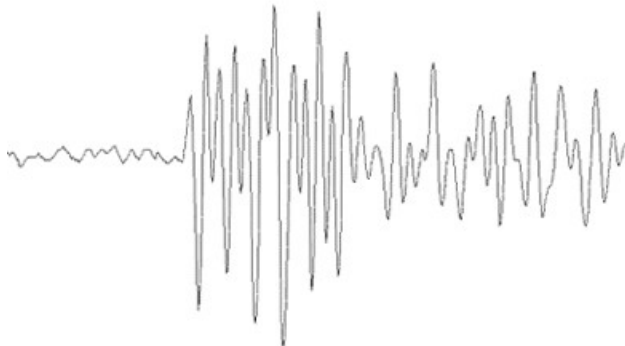
Injuries and deaths



Shelter requirements



Displaced households



Demographics Inventory in the Earthquake Model

Census data used to estimate direct social loss due to

1. Displaced households,
2. Casualties (injuries and deaths) due to earthquakes
3. Loss of building space that can be occupied



Shelter requirements



Injuries and
deaths



Displaced households

Earthquake Model Casualties

Hazus earthquake module considers injuries and deaths caused by building and bridge damage only. The values are **estimates only** and are expected to be used to approximate the magnitude of injuries and fatalities (i.e. hundreds vs thousands)

Earthquake module **excludes** casualties caused by:

- heart attacks
- car accidents
- falls
- power failure
- post-earthquake search and rescue, post-earthquake recovery
- electrocution
- tsunami
- landslides
- liquefaction
- fault rupture
- dam failures
- fires
- hazardous materials releases



Flood and Hurricane Models Casualties

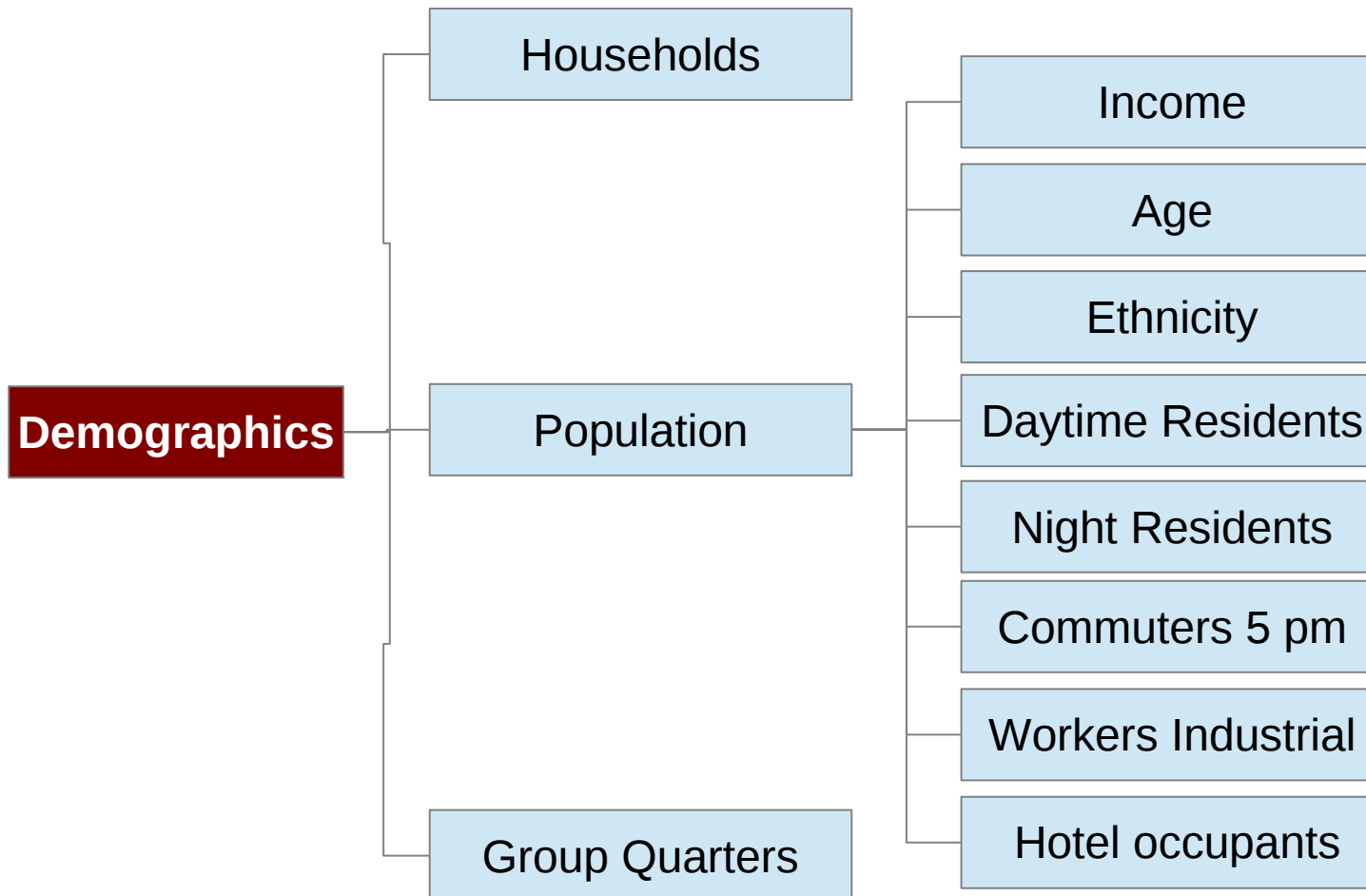
Hazus Flood and Hurricane modules
do not estimate injuries or deaths.

Flood and Hurricane modules
do estimate number of displaced households and
shelter requirements.



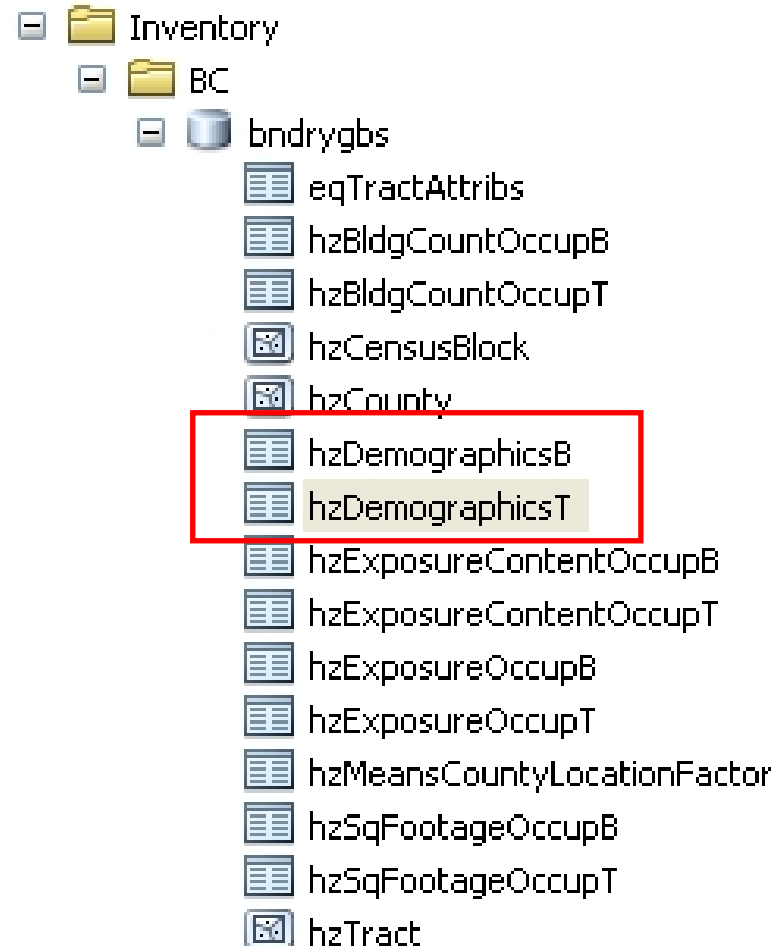
Demographic Inventory

Examples



Demographic Inventory

Where to find it



Demographic Inventory

What the table looks like.

OBJECTID *	Tract *	Population	Households	GroupQuarters	MaleLess16	Male16to65	MaleOver65	FemaleLess16	Female16to65	FemaleOver65
4008	59001001003	2463	1015	265	256	998	61	250	824	5
4009	59001001006	3618	1560	495	385	1301	184	369	1178	208
4010	59001001012	4217	1875	690	343	1555	242	344	1479	327
4011	59001001017	1873	775	205	192	703	85	162	634	49
4012	59001001019	1819	760	200	163	647	115	167	607	121
4013	59001001022	18267	7635	2270	1765	5731	1234	1665	6150	1550
4014	59001001028	6139	2825	970	474	1959	532	470	1993	637
4015	59001001035	5325	2095	395	473	1909	343	435	1912	268
4016	59001001037	1731	785	185	130	636	134	106	658	111
4017	59001001039	3002	1190	365	276	987	192	280	1036	259
4018	59001001040	735	285	65	64	251	60	63	250	47
4019	59001001043	700	290	70	65	242	53	69	239	37
4020	59001001046	2119	890	220	159	764	187	147	734	149
4021	59001001048	1563	670	175	125	574	106	129	524	97
4022	59001001801	67	25	0	1	29	5	10	11	9
4023	59001001802	0	0	0	0	0	0	0	0	0
4024	59001001803	159	50	15	17	58	0	17	53	0
4025	59001001804	153	55	15	21	50	9	11	44	10
4026	59001001805	0	0	0	0	0	0	0	0	0
4027	59001001806	169	65	20	11	60	9	16	59	5
4028	59001001807	0	0	0	0	0	0	0	0	0
4029	59003003004	4826	2370	910	371	1183	656	283	1447	850
4030	59003003010	2041	985	310	129	655	266	144	660	221



Derivation of Demographics Inventory - how it was done for Canada

Census Canada spatial units, listed by largest to smallest area:

Province (PRUID)

Census Division (CDUID)

Census Subdivision (in non-urban areas) (CSUID)

Census Tract (in urban areas) (CTUID)

Dissemination Area (DAUID)

Dissemination Block (DBUID) – no demographics available (due to privacy issues)



Derivation of Demographics Inventory - how it was done for Canada

Conversion of Census Canada spatial units to Hazus spatial units

Canadian Census Province → Hazus “State” or “Province/Territory”

Canadian Census Division → Hazus “County” also called “Census SubDivision” in
Hazus Canada

Canadian Census Subdivision or Census Tract → Hazus “Census Tract”

Canadian Dissemination Area → Hazus “Census Block”



Basic Concepts for Census units

- Census tracts have 2500-8000 inhabitants with relatively homogeneous population characteristics, economic status, and living conditions.
- Census tract divisions and boundaries change somewhat at each census.
- Census tract boundaries never cross county and district boundaries, and all the area within a county/district is contained within one or more census tracts. This “nested” characteristic allows for a unique division of land from country to province to county/district to census tract.
- Each Census unit is identified by a unique number (see next slide)
- There are many attributes available for the Census units that are used in the Hazus methodology.



Derivation of Demographics Inventory - how it was done for Canada

Conversion of Canadian unit ID numbers to Hazus unit ID numbers

2 digit Census Province Code (PRUID) → 2 digit Hazus “State” or “Province” number

example: Province 59 → **59** for British Columbia

4 digit Census Division (CDUID) → 5 digit Hazus “County” also called “SubDivision” in Hazus Canada

example: 5915 → **59015** for Greater Vancouver

7 digit Census Subdivision (CSUID) or 9 digit Census Tract (CTUID) → 11 digit Hazus “Tract” number

example: 933**0065.00** → 59015**006500** for tract within downtown Vancouver

8 digit Dissemination Area → 15 digit Hazus “Block” number

example: 5915**3681** → **590150065003681** for block within downtown Vancouver



Derivation of Demographics Inventory - how it was done for Canada

<u>Hazus Attribute</u>	<u>Canadian Census attribute</u>
Population	"Population, 2006"
Households	"Total number of private households"
GroupQuarters	"Non-family households"
MaleLess16	Males Ages, "0+4"+5-9"+10-14"+ (1/5 * "15-19")
Male16to65	Male Ages, (4/5*"15-19")+ "20-24"+ "25-29"+ "30-34"+ "35-39"+ "40-44"+ "45-49"+ "50-54"+ "55-59"+ "60-64"+ (1/5*"65-69")
MaleOver65	Male Ages, (4/5*"65-69") + "70-74"+ "75-79"+ "80-84"+ ">85"
FemaleLess16	Female Ages, "0+4"+5-9"+10-14"+ (1/5 * "15-19")
Female16to65	Female Ages, (4/5*"15-19")+ "20-24"+ "25-29"+ "30-34"+ "35-39"+ "40-44"+ "45-49"+ "50-54"+ "55-59"+ "60-64"+ (1/5*"65-69")
FemaleOver65	Female Ages, (4/5*"65-69") + "70-74"+ "75-79"+ "80-84"+ ">85"
MalePopulation	"Male, total"
FemalePopulation	"Female, total"
White	"Total population" – "Total Aboriginal" – "Total visible minority"
Black	"Visible minority – Black"
NativeAmerican	"Total Aboriginal identify population"
Asian	"West Asian origins" + "South Asian origins" + "East and Southeast Asian origins"
Hispanic	"Latin American"
PacifiIslander	"Pacific Island origins"
OtherRaceOnly	"Visible minority, n.i.e."

Derivation of Demographics Inventory - how it was done for Canada

<u>Hazus Attribute</u>	<u>Canadian Census attribute</u>
IncLess10	“Under \$10,000”
Inc20to30	“\$20,000 to \$29,999”
Inc30to40	“\$30,000 to \$39,999”
Inc40to50	“\$40,000 to \$49,999”
Inc50to60	“\$50,000 to \$59,999”
Inc60to75	“\$60,000 to \$69,999’ + (1/2 * “70,000 to \$79,999”)
Inc 75to100	(1/2*”\$70,000 - \$79,999”) + “\$80,000 - \$89,999” + “\$90,000 - \$99,999”
IncOver100	“\$100,000 and over”
ResidDay	$((0.70)*(0.75)*(DRES)) + (0.30)*(0.75)*(DRES)$, Refer to HAZUS technical manual Earthquake Model
ResidNight	“Total number of persons in private households”
Hotel	Data not available
Visitor WorkingCom	Data not available
	$[(0.99)*(0.98)*(COMW)] + [(0.80)*(0.20)*(DRES)] + [(0.80)*(0)] + [(0.80)*0] + [(0.01)*(0.98)*(COMW)] + [(0.20)*(0.20)*(DRES)] + [(0.20)*(0)] + [(1-PRLF)*(0.05)*(POP)]$, (Refer to HAZUS technical manual Earthquake Model)
WorkingInd Commuting5PM	$[(0.90)*(0.80)*(INDW)] + [(0.10)*(0.80)*(INDW)]$, (Refer to HAZUS technical manual Earthquake Model)
	$[(PRFIL)*[(0.05)*(POP) + (1.0)*(COMM)]] + [(0.50)*(1-PRFIL)*[(0.05)*(POP) + (1.0)*(COMM)]]$, (Refer to HAZUS technical manual Earthquake Model)



Derivation of Demographics Inventory

- how it was done for Canada

<u>Hazus Attribute</u>	<u>Canadian Census attribute</u>
OwnerSingleUnits	Actual data not available. Calculation based on closest US State statistics.
OwnerMultUnits	Actual data not available. Calculation based on closest US State statistics.
OwnerMultStructs	Data not available.
OwnerMHs	Data not available.
RenterSingleUnits	Actual data not available. Calculation based on closest US State statistics.
RenterMultUnits	Actual data not available. Calculation based on closest US State statistics.
RenterMultStructs	Data not available.
RenterMHs	Data not available.
VacantSingleUnits	Actual data not available. Calculation based on closest US State statistics.
VacantMultUnits	Actual data not available. Calculation based on closest US State statistics.
VacantMultStructs	Data not available.
VacantMHs	Data not available.



Derivation of Demographics Inventory

- how it was done for Canada

<u>Hazus Attribute</u>	<u>Canadian Census attribute</u>
BuiltBefore40	"Period of construction before 1946"
Built40to49	1/2 * "Period of construction, 1946 to 1960"
Built50to59	1/2 * "Period of construction, 1946 to 1960"
Built60to69	"Period of construction, 1960 to 1970 "
Built70to79	"Period of construction, 1971 to 1980"
Built80to89	"Period of construction, 1981 to 1985." + "Period of construction, 1986 to 1990."
Built90to98	"Period of construction, 1991 to 1995." + "Period of construction, 1996 to 2000."
BuiltAfter98	"Period of construction, 2001 to 2006"
MedianYearBuilt	Use weighted average of construction periods to calculate the median year. Period of construction years were averaged out to 1940, 1945, 1955, 1965, 1975, 1985, 1995, and 2002 were used for the calculation.
AvgRent	"Average gross rent \$"
AvgValue	"Average value of dwelling \$"
SchoolEnrollmentKto12	"5 to 9 years" + "10 to 14 years" + "15 to 19 years" * 0.8, (Refer to HAZUS technical manual Earthquake Model)
	Data not available.



Update Demographics in Provincial Database

Canadian Hazus Database contains demographic data from the 2006 Census.

If you have more up-to-date information, your census data can be imported into the Hazus demographics data tables using CDMS (Comprehensive Data Management System) to convert data into Hazus format and replace that of the Provincial Database.



Update Demographics in Provincial Database

- CDMS will read .mdb, .shp, and .xls files BUT attribute fields must be in correct format (text, integer, double number, etc) and field size (example, Class field is 5 characters)
- One record for each Hazus Block and/or Tract
- One column for each attribute, for which you have information
- In CDMS, update the “Aggregated Data” category and the “Demographics by Dissemination Area” layer and/or the “Demographics by Census Tract” layer



Further information

<http://www.fema.gov/hazus> technical and user manuals

Nicky.Hastings@nrcan.gc.ca for copy of Hazus Canada

Hazus User Groups on LinkedIn

Bert.Struik@nrcan.gc.ca CanHUG

Jean.Rivard@nrcan.gc.ca CanHUG East

Technical Support

<https://support.hazus.us>

helpdesk@support.hazus.us

Help Desk is available 24/7

1-877-336-2627 during office hours

