Regional Sustainable Development Partnerships
UNIVERSITY OF MINNESOTA
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Affordable Housing Location-Allocation Model

May 2012,
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Model Description

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The location-allocation model helps decision makers decide how many affordable housing units need to be developed in each of 29 communities with populations of 500 and greater in Region 5. It takes into consideration data on need for affordable housing, commute, number of jobs in each area and population, as well as the number of existing affordable rental units in each community.

As a base, the model uses the total number of existing housing units in the region, and the HUD figures on the percentage of housing units that need to be affordable in the region. Note that HUD specifies this percentage for three different affordability brackets: 30%, 50 and 80% of Area Median Income. The model provides results for each of those. The circumstances of communities differ with respect to the need of affordable housing. In some, there is more need than in others (i.e. more low income households spend a greater part of their income on housing), while others have greater employment opportunities. Both of these considerations are important in determining location of affordable housing, and the model results are is based on both. However, users of the model can determine the relative importance of each consideration by assigning weights for each. For example, a weight of 3 to "*jobs*" and 1 to "*need*" would mean that communities with a greater jobs market and lower need would have more units relative to ones with a smaller job market and greater need. The model can be run multiple times with different weights, allowing the user to determine the most suitable weights.

The model is based on ArcMAP 10 GIS software, and requires that software to run.

Objective

This model provides the **number of affordable housing units** needed in each of the municipalities examined.

Analysis is based on parameters of need, jobs/commute and population.

As per HUD data, the results are for each of the following affordability classes: 30%, 50% and 80% of area median income (AMI)

Basis of analysis – what we know

The following parameters were given by HUD in the FHEA Lookup table. The model defaults to these values , though they can be modified:

Total City-Township Housing Units in Region:	100,021		
	At **30%** AMI	At **50%** AMI	At **80%** AMI
Share of Housing Stock Needed Affordable:	5.85%	10.04%	15.30%
Total Units Needed: (existing units to be subtracted)	5,851	10,042	15,303

Outcome: what we want

If these numbers of affordable housing units are to be created, the model seeks to answer the question: "how many units should be created where?"

The result is a list with the optimal number of units per municipality for each affordability bracket, based on:

• Relative need
• Employment opportunities/commute
• Population

Focus of the analysis: municipalities with population **greater than 500**.

Total: 29 cities
(out of 68)

Royalton
Little Falls
Pierz
Long Prairie
Randall
Browerville
Clarissa
Eagle Bend
Motley
Baxter
Brainerd
Staples
Verndale
East Gull Lake
Wadena
Deerwood
Ironton
Crosby
Lake Shore
Nisswa
Pequot Lakes
Breezy Point
Sebeka
Crosslake
Pine River
Emily
Menahga
Walker
Cass Lake

Map: selected municipalities on the background of overall population distribution (Each brown dot represents 10 people).
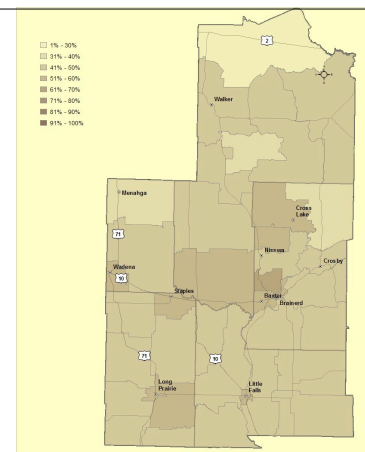(data: redistricting 2010)
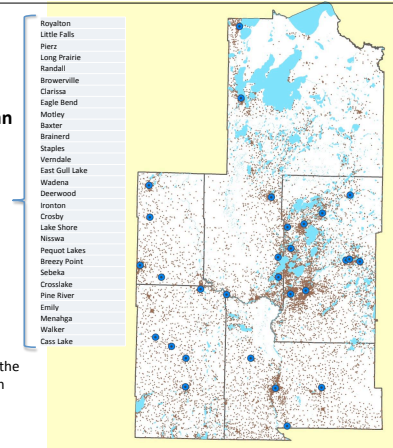
Parameters and data: **need**

What is the relative need of different communities for affordable housing?

Percentage of Lower-Income Households Spending 30% or More of Income on Housing

(MN Housing, 2011 data)

Census tracts representation of affordable housing needs

(MN Housing, 2011 data)

1% - 30%
31% - 40%
41% - 50%
51% - 60%
61% - 70%
71% - 80%
81% - 90%
91% - 100%

Parameters and data: **jobs/commute**

How many jobs are available for people living in the community?

For each community, an area reachable in 20 minutes was calculated. All jobs within that area were aggregated.

Data: 2010 DEED figures (Quarterly Census of Employment and Wages; number of wage earners by Minor Civil Division)
Method: Intersection of all MCD within 20 minute drive area, with jobs number aggregated.

Example:

20 minute drive areas from Baxter and Long Prairie.

Minor Civil Divisions are shaded according to the number of jobs within each.

Communities (dots) are shaded according to the number of jobs reachable with a 20 minute commute (incl. jobs outside the region, not represented in this map)
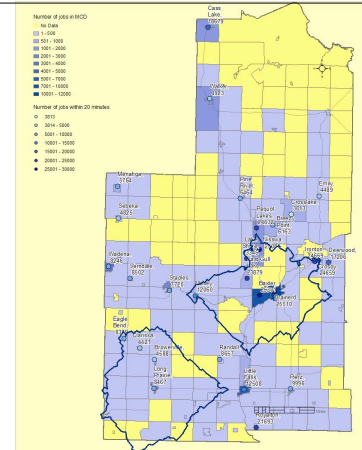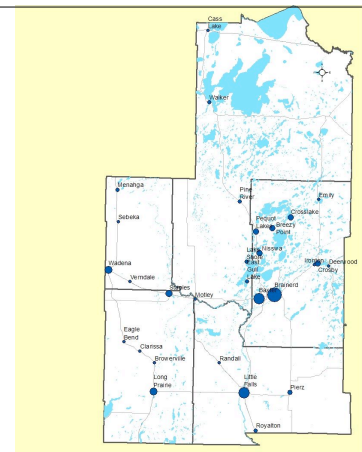

Parameters and data: **population**

The size of the community is related to the number of affordable housing units it can support.

(Data: redistricting population figures, 2010)

Municipalities with population greater than 500. Symbol size is proportional to population size.

(Data: redistricting 2010)

Logical framework

1. Each community is ranked on the basis of need and jobs. **Rank = [need]+[jobs]**
   (need and jobs are provided on 0-1 scale).
2. Rank is multiplied by population.
3. The number of "total units needed" is divided among all communities, directly proportionate to the product of their rank and population.
4. The number of existing units in each community is subtracted from the result.

Number of units is calculated for each of 30%, 50% and 80% AMI

Weighting: our choices

The equation **Rank = [need]+[jobs]** assumes that the need criteria is equally important to the jobs criteria when ranking affordable housing locations.

The model in fact allows for weighting these differently:

Rank = ([need] * [W$_{need}$]) + ([jobs] * [W$_{jobs}$])

Example (1)

Community	population	Existing units at 80% AMI	Weight		Rank (0-1)	Needed additional units at 80% AMI
			Jobs	Need		
Long Prairie	3,458	295	1	1	0.426	301
Baxter	7,610	155	1	1	0.782	2,254
Clarissa	681	60	1	1	0.289	20

Example (2)

Community	population	Existing units at 80% AMI	Weight		Rank (0-1)	Needed additional units at 80% AMI
			Jobs	Need		
			1	0	0.332	114
Long Prairie	3,458	295	1	1	0.426	301
			1	0	0.995	2,545
Baxter	7,610	155	1	1	0.782	2,254
			1	0	0.173	-18
Clarissa	681	60	1	1	0.289	20

Example (3)

Community	population	Existing units at 80% AMI	Weight		Rank (0-1)	Needed additional units at 80% AMI
			Jobs	Need		
Long Prairie	3,458	295	1	0	0.332	114
			1	1	0.426	301
			0	1	0.521	547
Baxter	7,610	155	1	0	0.995	2,545
			1	1	0.782	2,254
			0	1	0.569	1,871
Clarissa	681	60	1	0	0.173	-18
			1	1	0.289	20
			0	1	0.404	69

The model (under the hood)
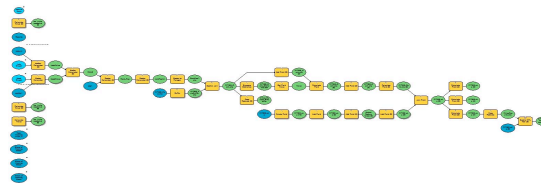
The model (user input)
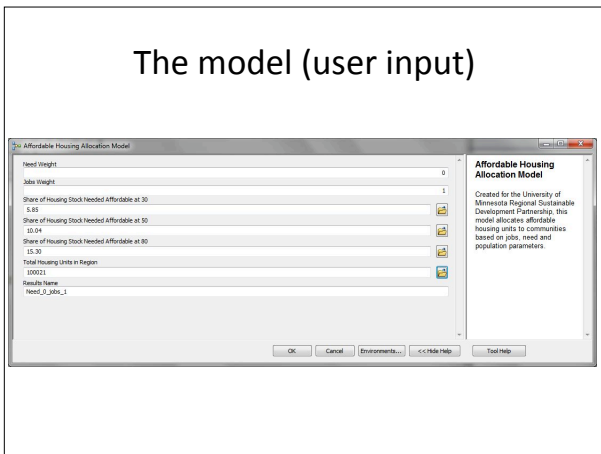
Results

Assumptions
(what we need to remember)

- Data on jobs:
  - Needs to be updated in future runs of the model.
  - Number of jobs derived through intersecting the 20 minute commute polygon with Minor Civil Divisions, aggregating all jobs in those MCD's. Limited accuracy.

Assumptions
(what we need to remember)

- Data on need:
  - Data is "Percentage of Lower-Income Households Spending 30% or More of Income on Housing" (MN Housing).
  - Data is by census tract, and does not correspond with municipality area. For this reason, the same municipality may have different need areas. Need value for such municipalities is the mean value.

Assumptions
(what we need to remember)

Neither the need nor the jobs values should be seen as absolute, rather as indicative.

E.g. the choice of a 20 minute commute is somewhat random: a different choice could alter results.

In any event, the two factors may not be equally important for the best allocation of affordable housing units.

A weight factor of 1:1 is not better than any other. The model can be used to provide **different options for comparison**.