Developing Innovation Village, Baltimore

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URSP688L: Planning Technologies
The University of Maryland – College Park
Fall, 2016

PALS - Partnership for Action Learning in Sustainability
An initiative of the National Center for Smart Growth

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Executive Summary

We researched the Innovation Village in Baltimore City to better understand which areas are most suitable for development, how accessible public transportation is within the area, the extent of community resources available, and the current employment environment. We used housing vacancy, property values, and access to rail transit to develop a suitability analysis for development. By creating a map of ¼-mile transit buffers, we were able to determine pedestrian accessibility to different parts of the Innovation Village resources. With maps showing the transit, employment and property value context, we hope to aid in the decision-making process for economic development, while encouraging strategies that encourage hiring programs for current residents and preventing displacement.

Project Background

Innovation Village (IV) is an urban, residential area of approximately seven square miles of west Baltimore. Its residents are low-income, uneducated, and unskilled (Figure 1). This is not fully representative, however, as there are clusters within the community that exhibit high economic opportunity and upward mobility. IV aims to revitalize the area to attract businesses, entrepreneurs, and develop infrastructure and amenities that support an environment where residents live, learn, work, and play. By doing so, IV organizers hope to create walkable, bicycle friendly community where residents are connected by transit and technology[1] without displacing the current population.

[1] Katz, Bruce, and Julie Wagner. "The Rise of Innovation Districts: A New Geography of Innovation in America." Brookings Institution Metropolitan Policy Program. Accessed December 17, 2016. https://www.brookings.edu/wp-content/uploads/2016/07/InnovationDistricts1.pdf.

Educational Attainment		Employment Population		Occupied Housing Unit		Household Income	
25 Years or Older	Percent	16 Years +	Percent	Type	Percent	$Thousand	Percent
No-Degree	75	In Labor Force	64	Owner	29	< 25	48
Associate's and Higher	25	Not In Labor Force	47	Renter	71	25 - 50	23
						50 - 75	29

Figure 1: U.S. Census Bureau, American Community Survey (ACS) 2010 - 2014

According to a Brookings Institution report, Innovation Districts are "Compact, transit-accessible geographic clusters of anchor institutions and companies packed with connections between anchors, startups and business accelerators."[2] The IV was established in January 2016 in an area of west-central Baltimore affected by the April 2015 riots. In an attempt to attract a wide range of individuals and groups, IV organizers hope that the project will be bolstered by the area's good transport links. While attracting startups (specifically the "creative economy," including the visual production industry) is an important objective, organizers hope that job growth will benefit local individuals with a variety of skill sets. Furthermore, organizers aim to attract a variety of businesses to the area, including dining and retail[3].

IV is characterized by a variety of strengths and weaknesses. As show in Figure 1 above, this is a very distressed area as a lack of higher education, unemployment, and personal income are obstacles and limitations for those seeking economic opportunity and upward mobility. However, several pockets within IV contain a highly-skilled workforce, a transportation network and relatively robust infrastructure.

Research Questions

Our initial research sought to create an understanding of how development can best be implemented to improve the neighborhood's economic situation and ensure employment

[2] Seltzer, Rick. "Innovation Village -- a Plan to Revitalize West Baltimore -- Launches on MLK Day." Baltimore Business Journal, January 18, 2016 Accessed September 27, 2016.

[3] Dresser, "Partnership aims to revitalize Central West Baltimore" and Seltzer, "Innovation Village."

opportunities for low-income residents. We hoped to improve IV's understanding of the area's employment, demographic, and transit characteristics, as well as the "skill gap" between potential jobs and the area's current workforce. IV also organizers hope to revitalize long-neglected housing and commercial areas, and we set out to research the fundamental attributes of those areas.[4]

The primary goal of the final project is threefold: 1) perform a suitability analysis to identify areas that are most ripe for development, 2) generate a better understanding of IV's workforce and employment environment, and 3) create a public map of IV's partner network. To construct the suitability analysis, we analyzed data on the area's transit access, vacancy rates, and property values.

Variables

Our exploratory analysis sourced block group-level data from the American Community Survey (ACS) database and transit shapefiles from Maryland's iMAP Database, including variables describing median household income, unemployment rate, worker employment industry, vacancy rates, means of transit, and travel time to work. We also created a transit map detailing bus, Charm City circulator, light rail, Amtrak, and Metro routes in the regional context of IV.

We analyzed the block group level for most of the data used to construct our employment analysis and suitability index. Using the metro- and light rail-stop shapefiles from iMAP's database, we examined transit access and the pedestrian network. Vacant unit addresses were sourced from the Baltimore's City Data. We used ACS block group-level data on median home values. For our employment characteristics study, we also used local labor market information data from the Longitudinal Employment-Household Dynamics (LEHD)[5] file. This information allowed us to identify the number of jobs, based on the North American Industry Classification

[4] Dresser, "Partnership aims to revitalize Central West Baltimore."

[5] United States Census Bureau. "LEHD Origin-Destination Employment Statistics (LODES) Dataset Structure Format Version 7.2." Accessed December 17, 2016. http://lehd.ces.census.gov/data/lodes/LODES7/LODESTechDoc7.2.pdf.

System (NAICS), and the employment sectors that are most dense within IV. Our partner network map was sourced from IV's website (http://www.innovatebaltimore.org).

Methodology

Our initial analysis mapped selected employment, income, housing, and transportation characteristics of IV. ACS files were imported and joined to block group-level shapefiles, displaying unemployment rates, median household income levels, concentrations of individuals employed in key industries, vacancy rates, average travel time to work, and transportation access. We then joined files, standardized statistics by block group, and symbolized the data in a uniformly formatted and comprehensible way.

Transit Buffers

Although ACS data exists for rates of commuters per mode of transportation, we believed it was more important to analyze the degree of connectivity within a neighborhood rather than the accessibility levels of its residents. We used shapefiles from iMAP's database to build a transportation network of Baltimore City. Initially, we included transit routes of MARC commuter rail, Amtrak, MTA Light Rail, Metro, Charm City circulator and bus routes (see Figure 6, Appendix 2). While bus routes cover most of the area within the Innovation Village, we chose to exclude bus stop data because iMAP data does not differentiate between bus routes, thus creating difficulties in calculating degrees of spatial accessibility. Even though Penn Station is close to IV, we excluded MARC and Amtrak stops, as they are not used for intra-city travel.

To spatially quantify transit access, we mapped quarter-mile buffers around each Metro and MTA Light Rail station within the IV boundaries. At first, we made simple ¼-mile buffers, but after some consideration, we chose to use polygon buffers that conformed to the local pedestrian network. The round buffers do not consider the existing street network and may cross areas that network doesn't support, so by creating polygon buffers we were able to perform a more nuanced analysis. We then computed the percent of land area in each block

group within a quarter mile of a Metro or light rail stop to better understand the transit connections to each of the locations and how accessible they are to members of the community.

To calculate the cost along the road network, we created a new feature containing the roads layer for network analysis, where the distance field from roads layer is set as the cost. To create buffers, we created different service area layers for network analysis (for busses, Metro, Light Rail and MARC routes) with their respective transit stops added as locations through Network Analyst toolbox. Finally, we set distance as default break in the analysis setting of service area layer property for each transit route and ultimately the buffers are created after clicking Solve on the Network analyst toolbar (see figure 2).

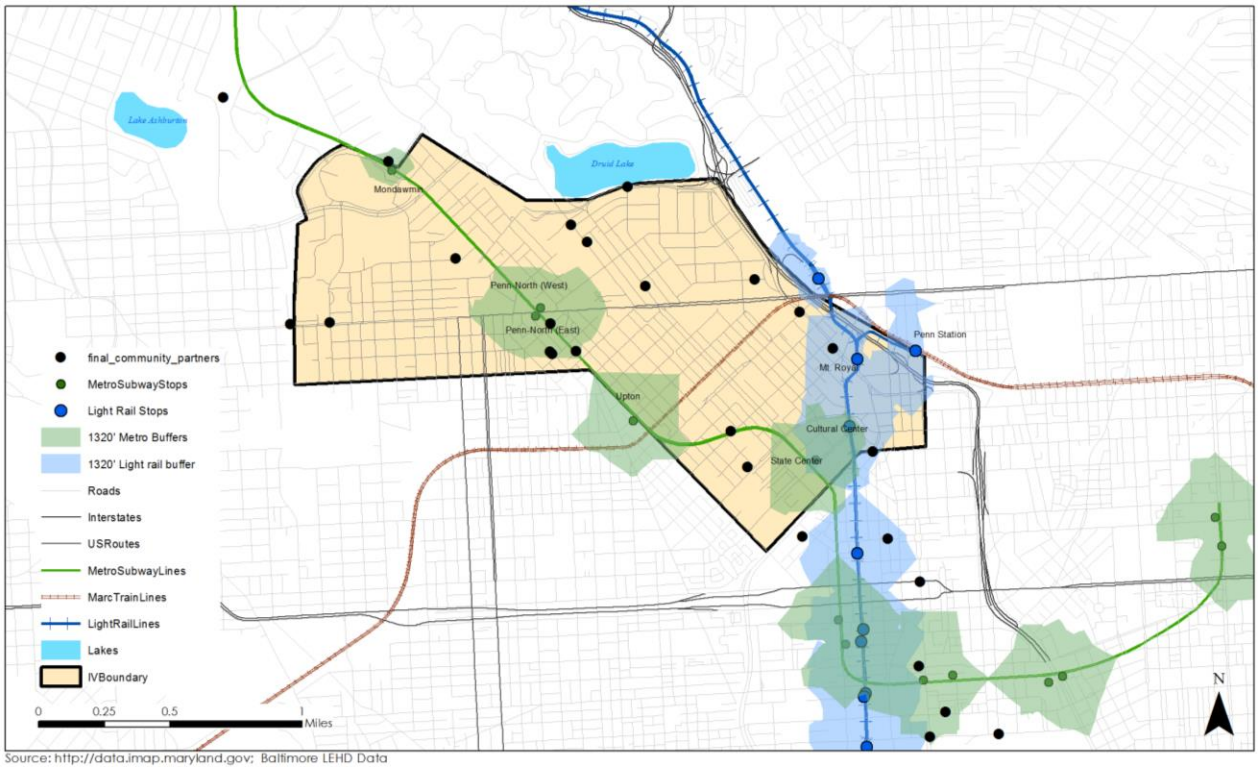


Figure 2: Quarter-Mile buffers around Metro, MARC and Light Rail Stops with Community Partners

Suitability Index

One of our most critical tasks was to decide which variables made an area suitable for development. We wanted to create a map that examined factors that were important to both long-standing residents and potential newcomers, so we decided to research the state of housing and transportation access. The variables we chose by no means amount to a comprehensive model determining the suitability of a neighborhood, but can help guide community leaders toward further research.

To construct our suitability analysis, we needed to create maps that visualized transit access, vacancy rates, and home values. We decided to construct our suitability index at the block group level, but only had block group-level data for median home values. Our first task was therefore to create a dataset that examined transit access and property vacancies on a block group level. (see Figures 7 and 8, Appendix 2).

The issue of vacancy was included because housing blight affects property values of the surrounding community; neighborhoods with high vacancy rates increase crime rates. Also, vacant lots can be redeveloped to house newcomers without displacing long-standing residents. We began our vacancy analysis within the Innovation Village by geocoding the LEHD vacant property index. After pinpointing these addresses to our Innovation Village map, we then created a kernel density map to quantify spatial concentrations of housing vacancies. We were then able to use the heatmap to obtain block group data on vacancies per surface area (see Figure 3).

Because low home prices may indicate that a neighborhood's housing stock is in disrepair, we decided to include a variable that spatially quantified median home values in Innovation Village. Not all inexpensive home values indicate disrepair, so we decided to analyze concentrations of homes under $100,000. To obtain a variable for our suitability index, we joined ACS block group sample data of home values to our Innovation Village map, and created a dataset of percentage of homes within a block group valued under $100,000 (see Figure 4).

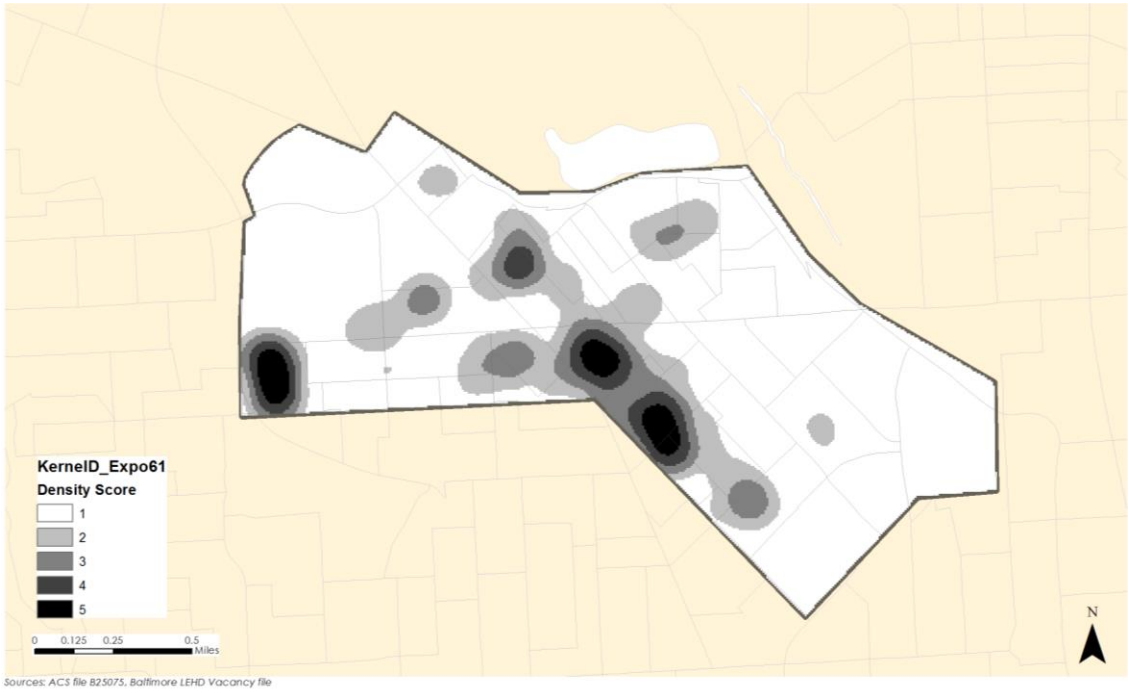


Figure 3: Vacancy Heat map

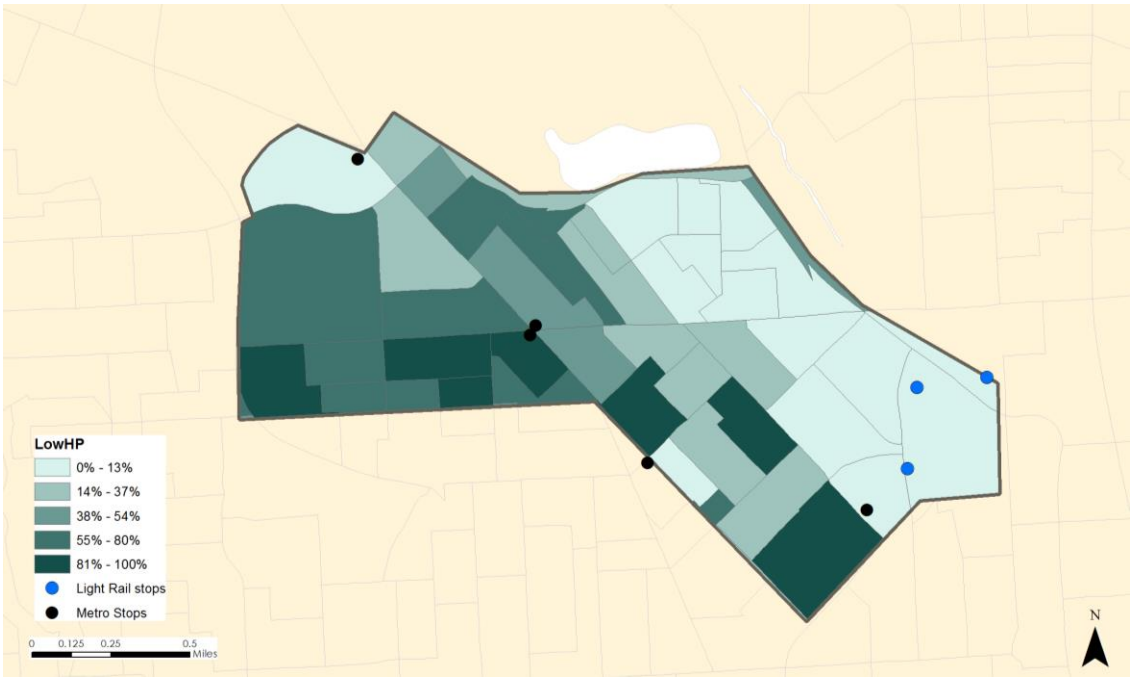


Figure 4: Block group concentrations of properties valued under $100,000

Each variable was quantified differently, and therefore needed to be standardized before it could be included in the final suitability index. To standardize each variable, we calculated the z-score, which quantifies the difference of each block group's characteristic from the Innovation Village mean. For example, an average of 20 percent of each block group within Innovation Village is within a quarter mile of a Light Rail or Metro station. The z-score represents how much more or less surface area of a block group is near a Light Rail or Metro stop compared to the Innovation Village mean. A z-score was calculated for each of the three variables, and a block group's aggregate z-score represents its final suitability score (see Appendix 1 for a tabular summary of the suitability index). Finally, a suitability map was generated (see Figure 5).

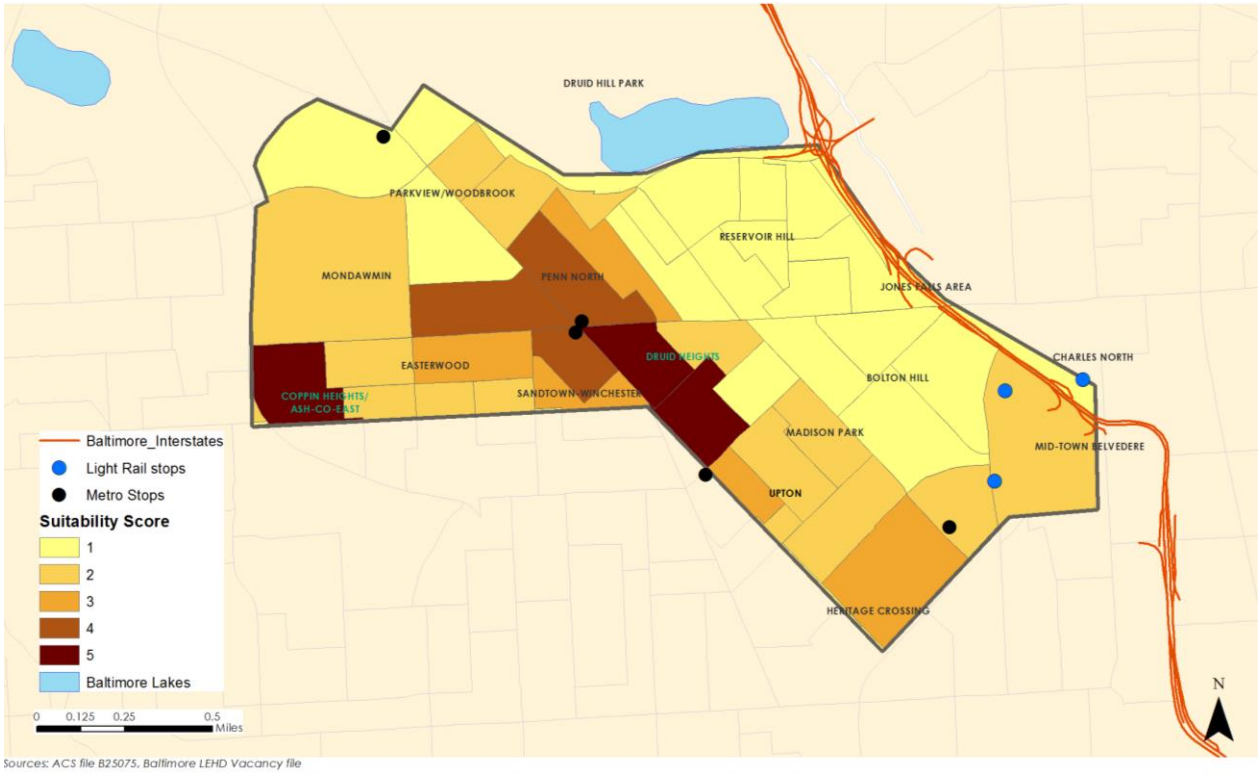


Figure 5: Suitability Index by Block Group Map

Employment and Poverty Analysis

This analysis uses the top five North American Industry Classification System (NAICS) sectors within IV to illustrate and identify areas of employment opportunity. The five sectors are shown

in Figure 9 of Appendix 2. To fully understand employment, poverty, and opportunity within IV, we geocoded the fifty-seven Innovation Village partner institutions (see Figure 10, Appendix 2) and used data retrieved from the Baltimore Neighborhood Indicators Alliance to create a heatmap of families receiving Temporary Assistance for Needy Families (TANF) (see Figure 11, Appendix 2). Specifically, we looked at anchor institutions that are inside or near the IV and considered their potential to be incubators and accelerators for entrepreneurs and startups.

Online Community Partner Map

We believed that both the public and Innovation Village staff would benefit from a consolidated map of Innovation Village's community partner network. Within the first several weeks of this project, we created a list of addresses, phone numbers, and emails of each of the Innovation Village partner. Many Innovation Village affiliates are nationwide organizations or are headquartered outside of Baltimore. Because we wanted to create a map that primarily benefitted the local community, we decided to include only organizations with physical representation inside Baltimore. This index was uploaded to ArcGIS Online, where we created a publicly accessible map of the Innovation Village partner network. The map can be accessed at **http://arcg.is/2gxr8Tc.** To facilitate spatial analysis undertakings in the future, we also created a geocoded feature class of the Innovation Village partner network.

Interpretation of Results

Through this research, we were attempting to answer 1) where development would be most suitable, 2) how accessible by transit the different community partners and resources are, and 3) how the current employment environment will influence and be impacted by the development.

Appendix 1 provides a summary of our suitability analysis. By examining housing vacancy, property values, and access to rail transit as determinants for suitable development locations,

we found that the best areas for development are along Pennsylvania Avenue in the southwestern part of the Innovation Village. The Pennsylvania Avenue corridor is an especially prime location for mixed-use development, as it is the site of a historic commercial district and is near a large residential area. Much of the Pennsylvania Avenue corridor is well-served by the Metro, making it well suited for individuals and businesses who require access to downtown Baltimore.

The eastern part of Innovation Village has very strong connections to downtown Baltimore. The central area is also fairly well connected by rail and bus lines. The eastern boundary also seems impenetrable and loses connectivity to the other side of Innovation Village due to the presence of the interstate, MARC, Amtrak and Light Rail lines as barriers. Major community partners inside Innovation Village are outside of the ¼-mile walking distance buffer of Metro and Light Rail, making them less accessible.

The employment sectors identified were education, retail, healthcare, management, and public administration. From this information, opportunities are ripe for accelerators and incubators as companies within the IV district are able to support such opportunities. Additionally, neighborhoods and families that are disenfranchised were highlighted to consider future plans that could potentially provide services that would benefit these underserved areas.

Limitations

As stated earlier, the data and shapefiles that we used to build our transit maps did not differentiate between the different routes or the time and frequency of the bus stops. It would be helpful to have this data to better understand the transit availability, since buses are an important form of transportation.

Recommendations and Future Research

Further research could supplement the lessons learned from this project. For example, crime data from the areas recommended for development could be used to better understand the challenges for developing in these neighborhoods. Furthermore, research could be done to identify vacant commercial and residential properties. Finally, research is needed to understand the strengths and weaknesses of Innovation Village's business landscape to identify opportunities for future commercial development. Because of the limited scope of our suitability analysis, the Innovation Village should use our findings to guide future research rather than treating it as a final study.

More specific research into what new jobs will be available for current residents would be helpful to address the area's employment needs. Working with the existing community partners and resources to better integrate could help cement relationships that build social safety nets.

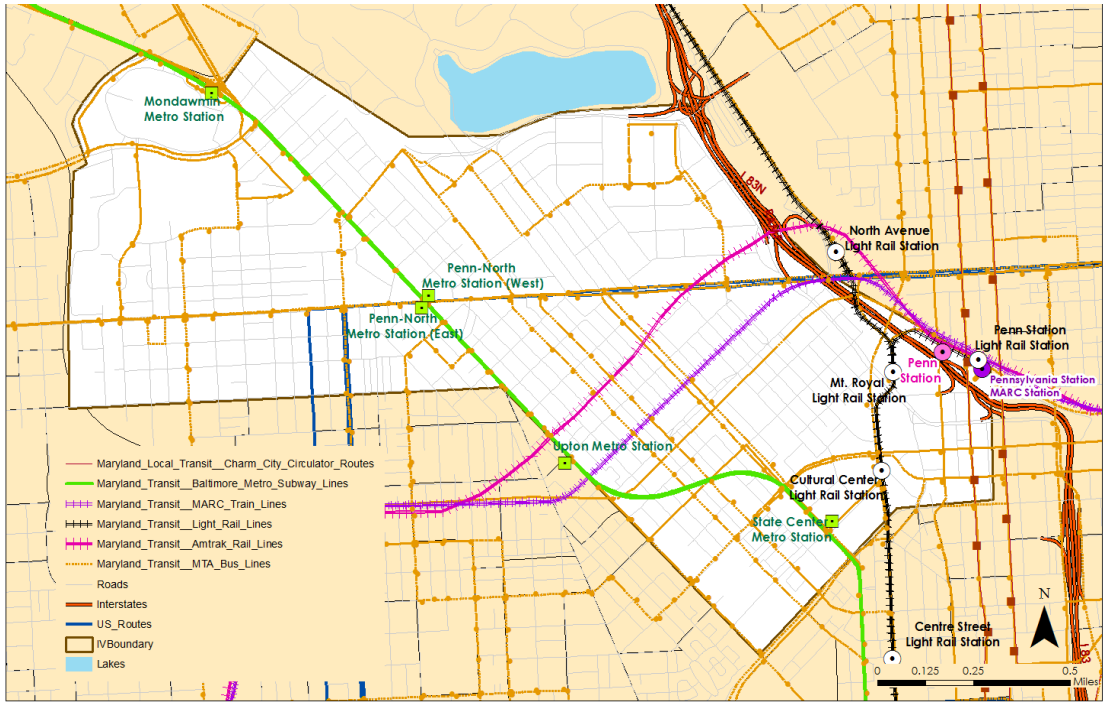
Task Coordination

Rick Jenarine: Community partners network map, LEHD employment sector maps/heat maps, TANF kernel density map, final report
Ridhima Mehrotra: Transit route and stops map, transit buffer map, transit-community linkage map, suitability analysis, PowerPoint, final report
Andrew Seguin: Vacancy kernel density map, home values map, suitability analysis, ArcGIS online map, final report
Claire Warner: Transit buffer map, transit-community linkage map, suitability analysis, final report

Appendix 1: Suitability Index Summary

Block Group	Vacancy	Housing	Transit	Total Z-score
245101402003	0.507292466	-1.190485259	1.715080696	1.031887903
245101503002	-0.556206808	1.107113969	-0.447347762	0.103559398
245101304002	-0.376639878	0.703372072	-0.447347762	-0.120615568
245101702003	-0.560956322	-1.190485259	1.762858131	0.011416551
245101501001	0.440477757	1.44448129	1.788049584	3.673008631
245101304001	-0.505739721	-0.310039328	-0.354987108	-1.170766157
245101301001	-0.536033665	-1.190485259	-0.447347762	-2.173866685
245101605001	-0.603902497	0.291314966	-0.447347762	-0.759935294
245101505002	-0.562944376	-0.902063167	-0.157260612	-1.622268154
245101304003	-0.322436871	0.294040554	-0.447347762	-0.475744079
245101501002	0.052726501	0.852503599	0.882051393	1.787281492
245101205001	-0.583499394	-1.190485259	-0.447347762	-2.221332414
245101504002	0.521948008	0.972680432	1.142910792	2.637539232
245101502003	-0.1140677	1.693735662	0.280357137	1.860025099
245101504003	0.204567311	0.87711754	-0.447347762	0.634337089
245101402004	-0.483567106	1.116891478	-0.396455379	0.236868992
245101403004	3.326643163	1.45338488	0.897832865	5.677860907
245101502001	-0.565794067	0.752568228	-0.447347762	-0.260573601
245101503003	3.954707463	1.545827044	-0.447347762	5.053186746
245101401004	-0.24968976	-1.190485259	-0.270152579	-1.710327598
245101403001	0.125485348	-0.325218983	-0.338266667	-0.538000302
245101703002	-0.607322919	-0.640400876	-0.447347762	-1.695071557
245101302004	-0.301064632	-1.190485259	-0.447347762	-1.938897653
245101401002	-0.524718151	-1.190485259	-0.447347762	-2.162551172
245101102001	-0.4041364	-1.012309627	1.788049584	0.371603557
245101301003	-0.040197199	-0.82789831	-0.447347762	-1.315443271
245101401001	-0.457816932	-1.190485259	-0.447347762	-2.095649953
245101401003	-0.38499504	-0.57741526	-0.447347762	-1.409758062
245101207003	-0.602335027	0.379067387	-0.447347762	-0.670615402
245101702002	0.312950373	-0.358497124	-0.339922629	-0.38546938
245101402001	-0.435131516	1.693735662	-0.447347762	0.811256384
245101303003	1.365953004	0.325308393	1.788049584	3.479310981
245101302003	-0.393737741	-1.190485259	-0.447347762	-2.031570762
245101504001	-0.142502003	-0.126069296	-0.443250924	-0.711822223
245101702001	-0.554560462	1.693735662	0.609903255	1.749078455
245101503001	-0.365745924	0.849071376	-0.447347762	0.03597769
245101301004	-0.563608807	-0.613641075	-0.447347762	-1.624597644
245101502002	-0.409223589	1.693735662	-0.447050964	0.837461109
245101302002	-0.506665143	-1.190485259	-0.447347762	-2.144498164
245101303002	0.421517552	0.617534773	0.543989187	1.583041512
245101403002	3.300914869	0.351081792	1.788049584	5.440046245
245101301002	-0.250013704	-1.190485259	-0.447347762	-1.887846725
245101402002	0.898959389	-0.746759407	0.130757189	0.282957172
245101303001	-0.150711091	-0.223965523	-0.447347762	-0.822024376
245101403003	-0.001953808	-0.669240201	-0.292202544	-0.963396553
245101703001	-0.604739611	-0.213570791	-0.447347762	-1.265658163
245101506002	-0.585071189	1.102101193	-0.447347762	0.069682242
245101501003	-0.606564215	0.022505576	-0.447347762	-1.031406402
245101302001	-0.519849936	-1.190485259	-0.447347762	-2.157682956

Appendix 2: Supporting Maps



Source: http://data.imap.maryland.gov/

Figure 6: All transit Routes and stops in regional context of Innovation Village

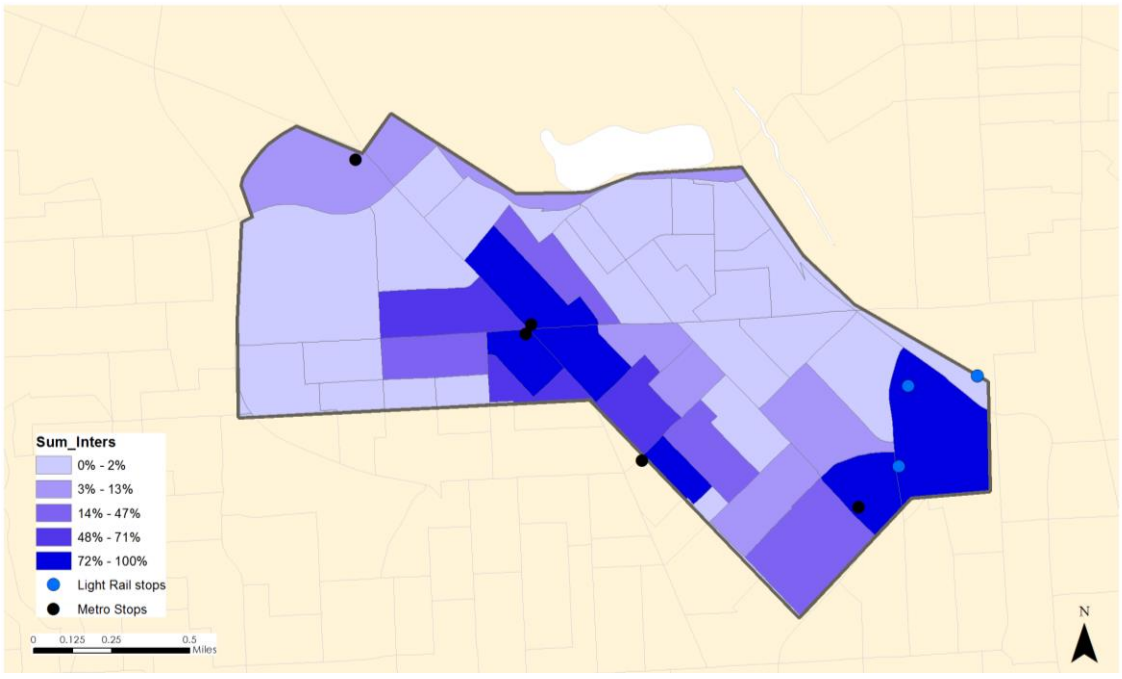


Figure 7: Transit coverage per block group

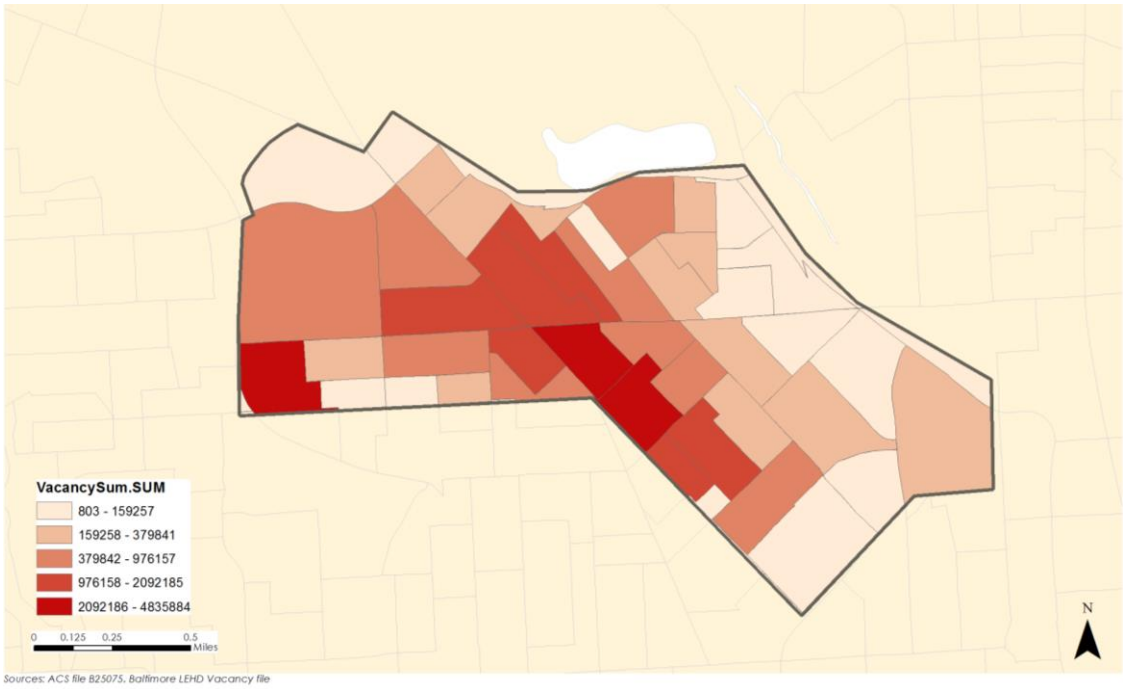
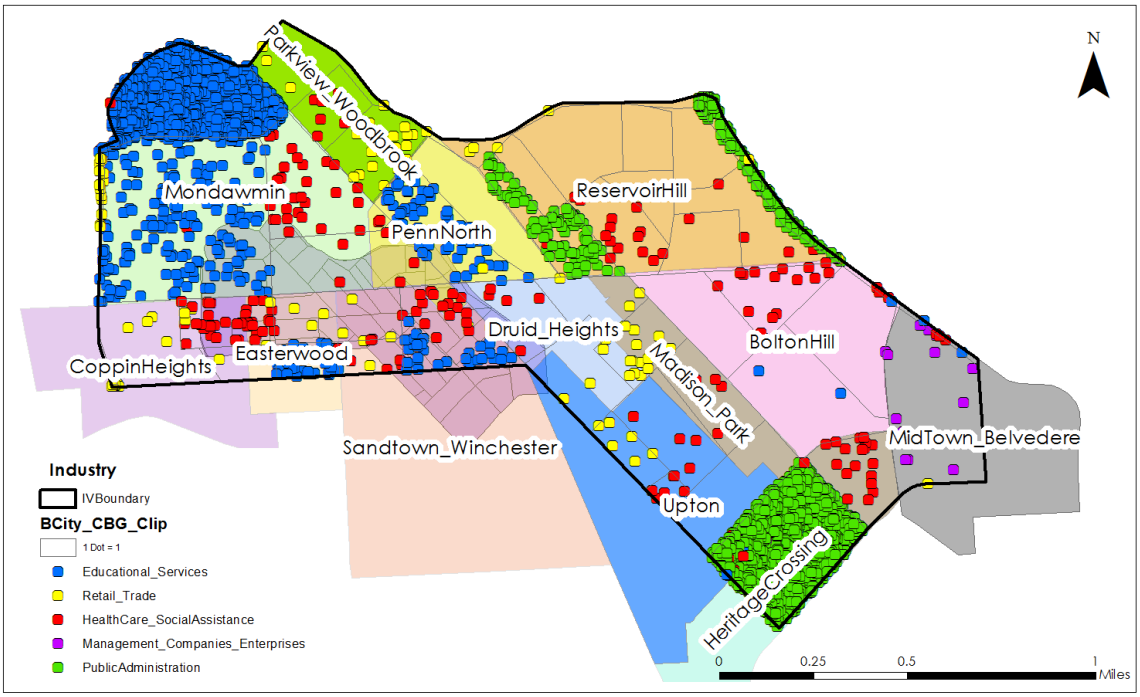
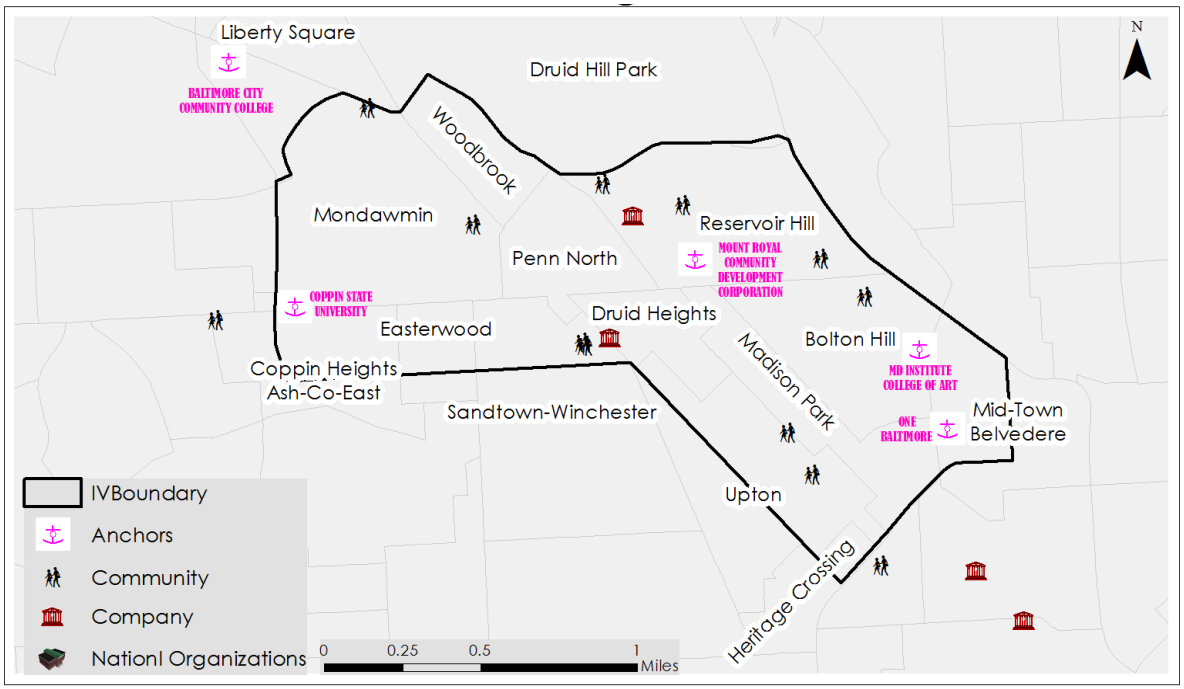


Figure 8: Vacancy by block group



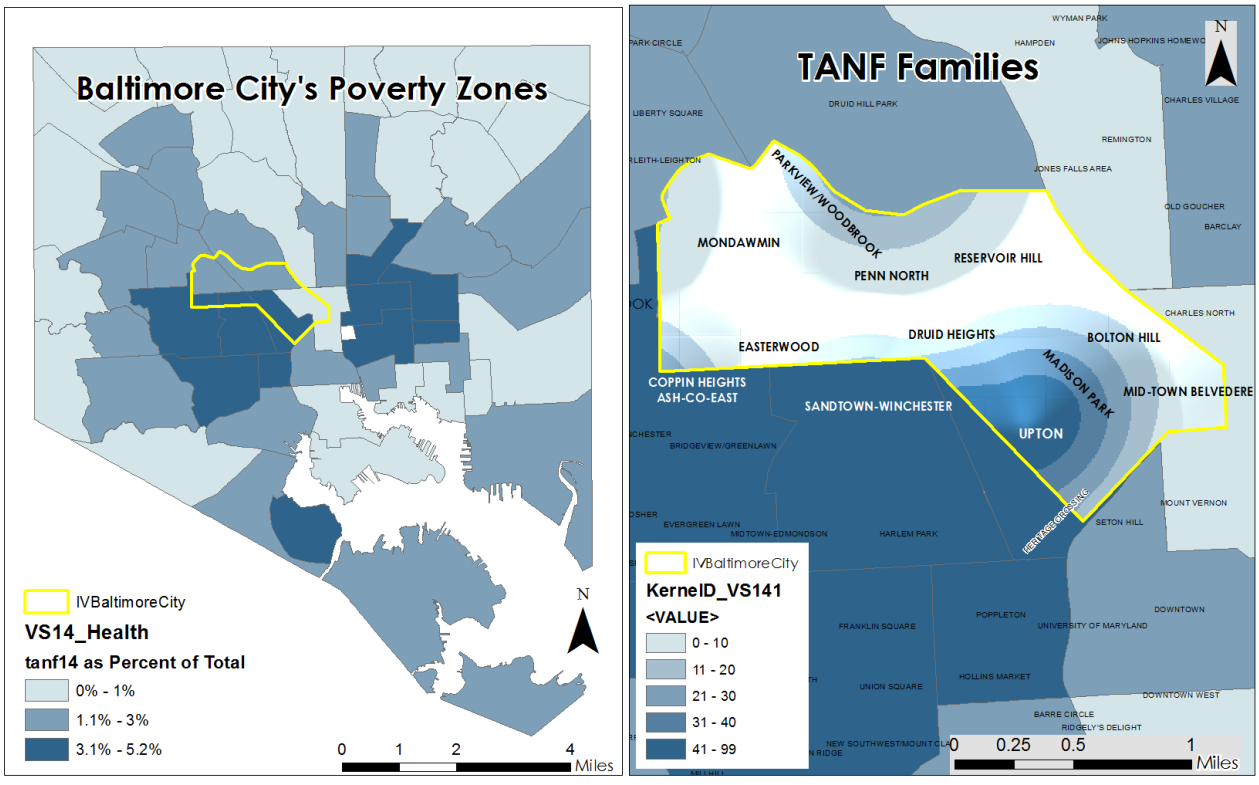
Source: http://lehd.ces.census.gov/data/lodes/LODES7/LODESTechDoc7.2.pdf

Figure 9: Innovation Village Employment density



Source: http://www.innovatebaltimore.org/

Figure 10: Innovation Village Partner Network



Source: https://data.baltimorecity.gov/

Figure 11: Heat map of TANF Families