Recycling Detroit:
Reinventing The Motor City by Reclaiming The Past

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Abstract

Detroit is dying; this is the popular perception of the once vibrant city, and one that is distressingly representative of reality. Meanwhile, national and state policymakers are restricting aid at a time of exceptional need for the city. This study makes an argument for increased engagement with Detroit and its struggles. It explains where the city stands today and how it arrived at this point before introducing a novel idea for helping Detroit transition to a more sustainable and equitable future economy. Specifically, it explores the possibility of creating a large-scale recycling center that would process waste (primarily from construction and demolition sources) from Detroit and other large Eastern Seaboard and Great Lakes cities. Waste is becoming an increasingly salient issue in the US, and finding ways to manage and create value from it will be an increasingly important industry in the next century. Detroit is ripe to position itself as the center of this industry in the United States. The development of such a center would create more diverse employment opportunities in central Detroit, generate revenue for the city, lead to greater rates of waste reclamation and provide a boost to the Great Lakes shipping industry, among many other potential benefits.

"Of the countless books written about Detroit, many chronicle the city's colorful rise: Cadillac and Chief Pontiac and Judge Woodward, Henry Ford and the Model T, Walter Reuther and the American labor movement, the Arsenal of Democracy and Motown music. Many other books dissect Detroit's fall from grace–that half-century (and counting) of riots and redlining, white flight and suburban sprawl, shuttered factories, broken dreams, and wasted lives." – Gallagher (2011), location 49

Detroit's dynamic history—replete with rapid rises, precipitous declines, and unmatched opportunity coupled with racial restriction—make it unique among major US cities. As the above quote makes clear, a city that was once celebrated as the ultimate emblem of the American dream, the manifestation of opportunity, is now the poster child of urban decline and the rust belt. Countless books, essays and studies have examined Detroit and attempted to isolate the roots of its decline. Among the factors for Detroit's decline identified in the study are the city's extreme reliance on one struggling industry, a troubled racial past that continues today, and persistent educational and economic divides. However, while the current study will begin with a further exploration of some of these factors–keeping an eye on those aspects of Detroit's past that will impact any attempt to alter its future–its primary purpose is not to re-hash the past. Instead, this paper responds to Detroit's troubles but is motivated by a search for a viable means to alter its current trajectory.

The same purpose motivates John Gallagher, a veteran reporter at the *Detroit Free Press,* in his 2011 book *Reimagining Detroit*. As Gallagher writes, he chooses "neither to question nor to quibble about how Detroit got where it is today…I'll seek to answer a more pressing question: *Where do we go from here?*"(Gallagher 2011, location 49). And this is the true question facing all those who are invested in the city's future.

I envisage a Detroit that has supplemented its traditional economic drivers with a cutting edge recycling infrastructure. This recycling system could help to revolutionize recycling in Detroit and its immediate surroundings, but it could also take advantage of Detroit's propitious transportation inheritance to cater to the region more broadly, achieving a scale that has not been possible in a US recycling system that is an inefficient patchwork of varying municipal waste frameworks with little interdependence or consistency. Located in the vast vacant expanses in the central city, a large-scale recycling center could help to create new blue-collar jobs, taking advantage of the city's industrial workforce and helping to alleviate some of the job loss caused by changes in the automobile industry, and it could also address the enormous disconnect between unemployment in the inner city and employment opportunity in the suburbs. A recycling center that processed construction and demolition waste could help to change the cost benefit calculation for building demolition and transform the multitude of vacant buildings across the rust belt from a headache for cities into an opportunity. The scale of the facility could enable the implementation of new technologies to significantly increase the reclamation rate of many plastics and metal ores. Finally, in addition to helping to dramatically increase current recycling rates in the region, it would also help to position Detroit as not just the industrial center of this new waste economy, but also as its knowledge capital. In these pages I will make the argument for the need for this recycling center, from an environmental and economic standpoint as well as in terms of how it could help Detroit to achieve a more vibrant, equitable future.

As Gallagher makes clear, Detroit is not alone in its current struggles. A transitioning global economy has left many cities once centered around fading industries in the lurch. Gallagher, while by no means optimistic about the future of Detroit, offers an interesting and nuanced view. Dismissing others who have attempted dramatic interventions to bring back the

vibrant, dense, downtown Detroit of old, he proposes that if residents and thinkers alike could look beyond the population statistics—the continued decline of which leads many to declare the inevitable death of the city—then a vibrant and dynamic, but smaller, Detroit would be attainable (Gallagher 2011). As he explains, many cities such as Flint, Youngstown and Cleveland have found productive ways to deal with population loss and turn it into a moment for positive reorientation and change. Gallagher paints a picture of a downsized and greener Detroit, one in which startups and technology firms are supported and thrive, rivers are day-lighted, smaller and denser neighborhoods turn into an arrangement that resembles transit-linked urban villages as opposed to the traditional American city model, and the remaining vacant space is turned into green-space and urban farms. It is hard to argue with Gallagher's depth of knowledge about the city, and his reasoning for the most part is sound, if overly optimistic at times. Most importantly, the vision he presents is highly desirable and worth striving for. Instead of harking back to the past, it presents a new future worth fighting for, and the value of this in mobilizing support around what will surely be years of hard work and struggle cannot be overstated.

Fundamentally, I think that Detroit's struggles position it to be able embrace change in a positive way, allowing flexibility to embrace the future and all of the changes it will require. Particularly, I believe that Detroit more than any other US city is positioned to revolutionize the sustainability of cities and the way urban areas interact with the natural world. In making this argument, I will build off of Gallagher's vision of a green, vibrant, smaller Detroit.[1] However, the primary focus of my research is to augment this vision by exploring the possibility of

[1] This heavy reliance on Gallagher reflects the fact that his is one of the most thorough and broad looks at the many ways Detroit will need to reorient towards the future. There are many excellent and thorough studies of how the city got where it is today, as well as briefer looks at individual aspects of the city, for example the future of the automobile industry.

developing a world-class recycling infrastructure in Detroit. This fundamental aspect of the triple bottom line—environmental, economic, and social sustainability—is lacking in Gallagher's analysis. I believe if implemented in a holistic and effective manner, such a recycling system could not only help reorient Detroit's trajectory, but also waste management in the US more broadly.

Here it is worth noting that I differ from Gallagher in my view of the potential for large-scale managed interventions in Detroit. In arguing for a whole-sale embracing of a shrinking city and the opportunity that provides, Gallagher writes that "generations have fought against urban population loss in every way imaginable—with tax abatements, federal grants, renaissance zones, big showcase projects such as stadiums and casinos, alphabet agencies such as DDAs [downtown development agency] and TIFs [tax increment financing], and a whole lot more" (Gallagher 2011, location 67). He quickly dismisses these types of initiatives, writing, "one could argue that without such heroic efforts, things would be even worse. Or one could admit that it's time to try something new" (Gallagher 2011, location 68).[2] Obviously, a project like developing a regional recycling center in Detroit would fall into this category, as it is through and through a large-scale intervention intended to alleviate some of the ills currently impacting the city.

I would argue that things like federal grants and "alphabet agencies" such as DDAs and TIFs will likely be a necessary component of this transition to a greener, smaller future for Detroit, particularly if the current recycling proposal is implemented. And I also believe some

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However, in terms of taking a holistic future-oriented look at the city's prospects, his book stands out.

[2] Later in his book Gallagher adds nuance to this assessment, proposing things like daylighting of streams and street re-development programs that would seem to touch on this past

efforts to resurrect the current urban core would prove a value-preserving move, as opposed to a vain fight against the inevitable. At the very least, some such efforts would seem necessary if this transition is to be done in a broadly equitable way that doesn't sacrifice the shorter-term prospects of Detroit's urban poor. A variety of factors that I will explore in more depth in later sections contribute to this assessment. In short, the tragic combination of a broke and corrupt city government, enormous unemployment rates among low-skilled workers and those trained to work in industry, as well as the current state of Detroit's infrastructure, make it hard to imagine a bearable transition that doesn't involve some of these instruments. While it is true that previous interventions in Detroit have screamed of economic luddites, leaders attempting to revive a previous vision of Detroit's economy or reorienting as the gambling capital of the region, say, this should not sully all such proposals. In fact, I would posit that the benefits that a recycling infrastructure would bring make the plan uniquely suited to Detroit; recycling is a service that will be in more and more demand in the future economy, it provides more varied job prospects than something like a high tech startup and it helps maintain a connection to—and builds off of—Detroit's infrastructure and labor force advantages, the city's industrial past.

In this paper I will begin with an exploration of some aspects of Detroit's history and its current socioeconomic state that are particularly relevant to the recycling proposal. From there I will enter a discussion of the recycling proposal, including: a discussion of theories and on-the-ground-realities of waste governance; the need for a recycling revolution; transportation concerns; what type of waste would be best-suited to regional centralization in Detroit; a more in-depth look at construction and demolition waste and, in concert with this, a look at the state of abandoned buildings in Detroit; and what the current state of recycling in Detroit is. Finally, I

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model to save Detroit. In the end his gripe seems to be more with the types of projects that have

will conclude with a discussion of the state of entrepreneurship in Detroit, and how a recycling center could prove a catalyst for driving broader economic reinvention in the city, bringing us back, full-circle, to how recycling the Motor City could help in the transition to a leaner, meaner Detroit.

The Motor City's Crash

The history of Detroit is fascinating and nuanced. A number of authoritative works have been written on the subject, and I will not try to do the city's rich past full justice in these pages. Instead I will attempt to provide a brief account of the particularly relevant parts of the city's past.[3] What emerges in my reading of the city's historical inheritance is a preponderance of contradictions. Contradictions that make Detroit a fascinating puzzle for policy-makers and others tasked with charting its future. The site of the emergence of the American labor movement and the birthplace of the American middle class now suffers from some of the worst employment opportunities in the country. Detroit is one of the poorest inner cities in the US but it is surrounded by some of the wealthiest suburbs. It is the city that transformed the way we move through the world, but is now spinning its wheels as the poster child of industrial decline. It is a complex place that will require varied remedies for its current ills, remedies that account for the way that the city's past has shaped everything from the current employment landscape to

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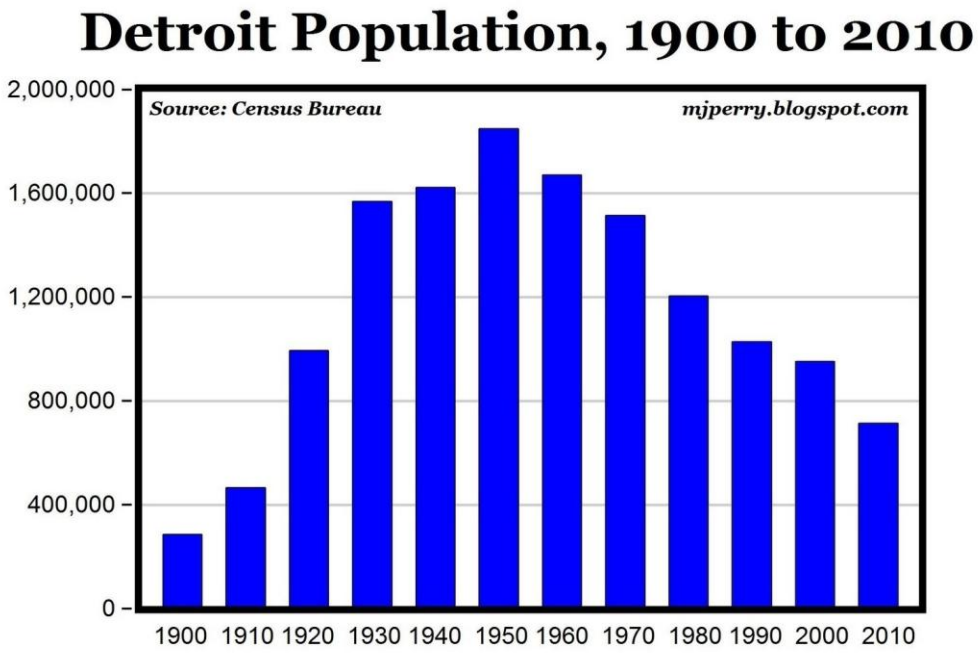
been undertaken, and their underlying motivation, than development projects as a class.

[3] For a more thorough account of Detroit's history see *Detroit Divided* by Reynolds Farley, Sheldon Danziger and Harry J. Holzer published in 2004. The book is a volume in The Multi-City Study of Urban Inequality, a project that uses wide-ranging surveys of households and employers to elucidate the socioeconomic divisions challenging America's cities. Though, because it does not anticipate the shard downturn in Detroit brought on by the 2008 financial crisis, many of its predictions for the future are overly optimistic, its account of the past and Detroit's socioeconomic inheritance is fascinating. Another seminal work is *The Origins of the*

the contentious style in which much of the politics in the region is conducted. In this section I will attempt to lay out these contradictions, and to elucidate the ways in which a recycling center would be an intervention well-suited to addressing these disparities.

At the turn of the 20th century, the city, whose humble beginnings date to a fur trading post, had a population of fewer than 400,000 people. In the 1950s that figure had catapulted to just under 2 million inhabitants. To put that frenetic growth into perspective, the US population roughly doubled during the same period. However, the boom was short-lived and opportunity soon turned into closure in an inner-city that is now among the nation's poorest. This story, of how a city that was the emblem of opportunity in the US for blue-collar workers turned into the quintessential case study of an urban under-class has relevance for any policies or efforts to change the city's trajectory implemented today.



Urban Crisis: Race and Inequality in Postwar Detroit written by Thomas J. Sugrue and published in 1998.

This graph shows the population of Detroit from 1900-2010. As is clear, Detroit's population has been highly volatile apart from a brief period of relative consistency in between 1930 and 1960. Graphic: (Perry 2011)

Expansion and Opportunity

During the first half of the 20th century millions of Americans emigrated to cities from rural areas where they had worked on farms (Farley, Couper, and Krysan 2007). They were driven by changing farm technology that made them obsolete, and also by the appeal of industrial jobs in cities. General industry drove Detroit's growth at the beginning of the 20th century, however this boom didn't really take off until the emergence of the auto industry. As Farley, Danziger and Holzer (2004) hold, Detroit "would now resemble a dozen other medium-sized Midwestern industrial towns" if it weren't for the automobile industry (6). The emergence of Ford's assembly line and a number of other propitious factors allowed Detroit to establish itself as the center of automobile production at a time when numerous city's were competing for the industry (Farley, Couper, and Krysan 2007). This growth was escalated by WWI, and the city's production of trucks, tanks, planes and other heavy equipment earned Detroit the sobriquet the "Arsenal of Democracy." Following the second war, this momentum continued as the newly-found affluence of the American middle-class translated into a transportation revolution, driven by the Motor City. Detroit and the automobile industry benefited immensely as the suburbs emerged and the way Americans got around shifted more and more towards the automobile.

Two very important shifts occurred during this era, one in terms of employer/employee relations and the other relating to the racial makeup of Detroit. In the automobile factories, not only were army vehicles and family cars built, but so was the American blue-collar middle class and a strong labor movement. While a few plants were unionized before Franklin D. Roosevelt's

administration, the 1935 Wagner Act revolutionized employer worker relations in the auto industry. The auto industry was vulnerable to strikes, particularly sit-ins, and the United Auto Workers, which emerged as the preeminent union for workers in the industry, used this to their advantage. While worker-management-relations were extremely volatile in the post-war era, at a time when car sales were booming and profits were abundant management was willing to make many concessions to workers. In fact, the UAW "successfully obtained the employment benefits that most white-collar—and many blue-collar—employees now take for granted: wages that increase steadily with inflation, paid vacations, paid holidays, employer paid health insurance for both workers and their families, guaranteed disability payments and pensions" (Farley, Couper and Krysan 2007, 4). This fundamental shift in the way labor interacted with management also had consequences for our second major shift, the influx of African Americans into Detroit.

As stated, changing production patterns on farms led to mass migration to American cities. Particularly likely to come to Detroit were African Americans from the South, who were also driven out by horrendous discrimination in the Jim Crow South. As Sugrue (2005) writes, "whether attracted to the opportunities of the Motor City, or pushed from tiny farm plots they had toiled for generations, southern blacks looked to Detroit as a land of hope, a 'New Canaan'" (location 807). This migration started before WWII, however it increased significantly during the war years, and employment opportunities didn't truly open up until 1941 and 1942. During these two years, many Detroit firms that had exclusively employed whites began to hire African Americans as well as women (Sugrue 2005). This move was primarily driven by a tight labor market, pressure from unions[4] and other civil groups, and by government mandate through

[4] As Farley, Couper and Krysan (2004) explain, one of the primary union motications for supporting equal employment, membership in unions, and equal pay was that African American workers in the 1930s were used as strike-breakers.

Roosevelt's Executive Order 8802, which ordered nondiscrimination in hiring in war industries (Sugrue 2005). As Detroit was at this point operating as the "Arsenal of Democracy," this final leverage point was particularly effective. And even though there were fears that with the end of the war, jobs would disappear—especially for African Americans—the city made a seamless transition to post-war production, and African Americans continued moving into the city (Farley, Danziger, and Holzer 2004). It is also worth noting that during this period opportunities for employment for women also increased, especially in occupations that could be redefined as "feminine," such as those parts production where small, nimble fingers were considered advantageous (Sugrue 2005).

This earlier history of Detroit, one of the first places where African Americans could really find opportunity, makes the current state of affairs particularly distressing. However, this era was by no means utopian in terms of race relations. White workers frequently organized hate strikes, protesting the hiring of African American workers at all-white firms or protesting when African Americans were promoted to more senior positions which had previously been reserved to whites (Sugrue 2005). And during this period one of the most violent race riots in American history took place in summer 1943.

The Road to Today

In comparison to other cities in the US, Detroit during this era was the embodiment of opportunity for advancement into the ranks of the middle class, especially for African American workers fleeing the South. Given this, it is hard to understand how Detroit's inner-city got to be as segregated and impoverished as it is. Where did the high-paying blue collar jobs that fueled

the growth of a middle class of all races in Detroit go? How did Detroit go from being a majority white city to a central city that is over 80% African American?

The precipitous decline of Detroit has been documented and re-documented. Clearly, global competition in the automobile industry did not help the city—which was particularly dependent on the one industry and never developed financial centers or a more varied economy like other major US cities (Farley, Couper, and Krysan 2007). But to portray Detroit as simply a victim of economic change beyond its control is inaccurate, and it ignores the point we have arrived at. The metropolitan area of Detroit is not a poor one. Instead, it has one of the highest median incomes in the US, exceeding cities like NYC and LA (Farley, Danziger, and Holzer 2004). This is due to the prosperity of the white suburban ring surrounding Detroit. So instead of needing to explain the overall decline of the region, the question is more correctly posed, how do you explain the phenomenal struggles of the urban core compared to its highly affluent suburbs?

This story is more controversial than the simple assertion of external global forces, as it becomes in many ways a story of race—an issue that has moved back to the forefront of discussion in America in the wake of the fatal shooting of Trayvon Martin. While much political attention, especially in the 1990s, has focused on welfare programs and a culture of poverty, in Detroit's case there is a long history of discriminatory practices that contribute to the city's current state. The assertions of a welfare culture are particularly inaccurate and harmful in the case of Detroit, where studies find African Americans spend more time looking for jobs than white job-seekers and place higher importance in the value of skills and educational attainment as it relates to employment (Farley, Danziger and Holzer 2004). Sugrue (2005) provides a highly readable and credible account of some of the processes that led to the racial polarization of Detroit, and his book is worth a read for anyone trying to understand not only Detroit but also

other struggling urban cores in the US. As Sugrue recounts, a few of the forces that drove the suburb/city and black white/divide began well before the obvious tipping point of the 1967 riots, and include: residential segregation, intentionally enforced through violence against black families and redlining, as well as through unintentional factors such as federal housing loans which whites were more able to access and used to move to all-white neighborhoods[5]; the move of industrial plants and jobs to the wealthier suburbs; discrimination in hiring and promotion in Detroit area firms; and of course the virulent racial politics that led up to and followed the infamous race riots of 1967—obviously a cataclysmic and polarizing event that has had a profound effect on Detroit ever since. It is not difficult to see how these factors would also impact other issues of equity such as educational opportunity. And looking at these forces holistically, it is not at all surprising that the city is where it is today.

This brief exploration of Detroit's past, the promises of the period surrounding the wars followed by the racial restriction and strife of the sixties and seventies, and the subsequent dramatic decline of central Detroit, serves two purposes. It opens a window to the city's psyche, giving an idea of the foundation on which any intervention must be built. However, more than this, it provides one of the most important rationales for attempting projects like the recycling center. In light of the ways in which policy and societal pressures have continually disadvantaged residents of inner-city Detroit, particularly African Americans, the plight of the city is harder to ignore. When we are complicit in a wrong, it is harder to simply let it play out.

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[5] In a telling quote, Sugrue says in a 1999 interview with the Journal for Multi-media History that: "I grew up on the city's northwest side. It was a typical neighborhood of modest houses built in the 1920s and the 1940s and between 1970 and 1973, in a period of about 3 1/2 years, the neighborhood went from being all white to being almost all African American—something that at the time as a naive child I viewed as racial integration because I was there as the neighborhood was in the process of transformation but later realized was just a very short

The easy route would be to sit back and say that the urban poor need to pull themselves up by their bootstraps and take ownership for the city's reinvention—to blame the victims of years of discriminatory policies and practices for their results, and this is exactly what many in Lansing are doing. What is harder is to accept the moral implications of how we got here, to recognize that there is a responsibility of everyone to fight for an equitable Detroit. I recognize that this is likely a construction that will touch a nerve for many who have followed the trials and tribulations of Detroit. Long-time mayor Coleman Young was infamous for portraying the city's struggles as a product of white racism and oppression, an economic battle between the city and the suburbs (Chafets 1990). He dismissed the idea that racism was a two-way street, holding that racism requires oppression, and that oppression was in fact a one-way process (Chafets 1990), and this was not a particularly well-received proposition beyond the city's borders. However, just because this issue has been spun for political purposes in the past does not mean it is not in some ways an accurate interpretation of the city's past. While Mayor Young's assertions attributed more malice and intentional oppression than was actually present, the overall truth of a system that oppressed and confined the opportunities of African Americans in the inner-city seems thoroughly and convincingly documented.

Two of the most pressing issues currently facing inner-city communities across the country are segregated communities and the lack of a meaningful connection—and access—to work (Sugrue 1999). In light of this and the policies and societal forces that brought us to this point, embracing a future Detroit that resembles a Silicon Valley of the Midwest, or a disintegration of the urban core into up-and-coming urban villages as Gallagher (2011) and others envision, seems an ethically untenable path forward—unless we are able find a more productive interim period that

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stepping stone between all white segregation to all black segregation. So it was an interesting

does not sacrifice Detroit's current residents to the buzz saw of "economic change." While the notion of Silicon Valley East sounds a little too close to the traditional patterns of racial segregation being imposed again—this time with an emphasis on environmentally friendly change, with additional greenspace and denser housing, and white people moving in instead of out—it seems to do little to address the inequality of the current arrangement.

Today's Challenges

In this section I will explore the challenges currently facing Detroit.. An exploration of these factors provides an orientation as to what issues an effective intervention like the current recycling idea would need to address. Farley, Danziger and Holzer (2004) provide a thorough look at Detroit's struggles, and while their work closes with tempered optimism as to the fate of Detroit, many of the areas in which they saw potential for improvement have been exacerbated by the financial crisis of 2008. The following are two of the most relevant findings from their study that was largely based on an innovative survey of employees and employers as part of the Multi-City Study of Urban Inequality.

The Labor Market

While Farley, Danziger and Holzer (2004) take issue with what they see as an exaggeration by Sugrue in saying that Detroit has gone from a bastion of opportunity to a reservation of the poor, they do present a number of statistics that are telling about current job prospects in Detroit. First, while in 1970 three in four African American men were making enough money to push a family of four above the poverty line, that figure in 1990 had dropped to

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process of really dramatic transformation in a very short period of time" (Sugrue 2005)

one half. It is worth noting however that, while there remain large differences between labor prospects between African American and white men, the comparable gap for women is approaching negligible. Their study finds that these gaps are attributable to four main factors: deindustrialization, which led to the disappearance of many well-paying blue-collar jobs (52 % of African American Men worked in manufacturing, 98% of these in blue-collar positions); discrimination in hiring which remains an issue in Detroit; a skills mismatch between the increasing demand for highly-skilled workers and the decreasing educational and occupational attainment of African American residents; and finally, a spatial mismatch, in which African Americans who reside primarily in the inner-city and lack contacts in the suburbs or transportation with which to get to a job, are isolated from employment opportunities in the suburban ring. This last issue is troubling as the authors find that one of the most promising avenues for increased equality is for African Americans to gain employment in the suburbs, but African Americans are far less likely to apply for jobs in the suburbs and face more discrimination from employers in these areas.

Providing an outlook for the job market, the authors hoped for maintenance of the auto industry in Detroit, which did not hold. Instead, the crash of the industry during the financial crisis of 2008 led to the loss of many more blue-collar manufacturing jobs. After the bailout of the Big Four, these jobs haven't returned to the region even though corporate jobs in Detroit have. The big four have now stabilized, and are making record profits in some cases, but most of the manufacturing jobs lost appear unlikely to return to the region. Additionally, in addressing the skill mismatch in Detroit, the authors write that these gaps "would be lessened if blacks who enter Detroit's labor market in the future have higher educational attainment" (Farley, Danziger and Holzer 2004,106). Given the well-known struggles of the Detroit school district (Harris

2011) and the fact that even Wayne State, one of the few bright spots economically in predominantly African American Detroit, struggles to graduate African American students and has the worst racial gap in terms of graduation between white and African American students in the country, according to a recent Education Trust Report (French 2012), this seems optimistic at best. The combination of these two facts about the job market in Detroit is particularly problematic. The tendency for African Americans to be unable to find employment in the suburbs combined with the increase in skilled positions in the central city is a devastating combination. Detroit has remained the center for engineering and high-skill jobs in the auto industry and demand for highly-educated workers has increased rapidly at the same time as low-skilled jobs have rapidly disappeared. Policy considerations must address this reality.

Consequences of Segregation

As the authors explore, the scholarly literature paints a clear picture that racial segregation can have a negative effect on residents. A 1995 study by John Yinger found that residential segregation was a significant factor in perpetuation of gaps in employment, income, poverty, and wealth holdings. Additionally, studies have shown correlations between residence of African Americans in segregated neighborhoods and high school dropout rates, idleness, as well as young women and their likelihood to be single mothers. Even areas like infant mortality rate are affected by segregation, even when other factors are accounted for, as is the homicide rate and adult mortality rate.

The extreme segregation of Detroit was brought about by overt policies and actions, but it has been maintained by more subtle forces, including the preference of both African Americans and whites not to live in neighborhoods that consist exclusively of the other race. However, as

the authors wrote at the time of the study, segregation is starting to show signs of improvement in Detroit, and this has continued in recent years, especially in the suburbs of Oakland County (Metzger 2010). Yet it remains an important factor in policy decisions, as development programs should keep an eye on potential for creating economic realities that encourage mixed employment and communities. There is a great need for more jobs in the central city, particularly jobs that cater to employees with varying degrees of educational and professional attainment.

Taking the Long View

Detroit has been described as a reservation for the poor, and this description reflects the narrative that has just been explored. At the same time as jobs and development have fled the city to the suburban ring, residents of inner-city Detroit (mostly African American) have been limited in their ability to follow them. Now, many live not just removed from employment by a skills mismatch, but also by simple geographic alienation. Add to this a sub-par public transportation system and the importance of this problem becomes clear.

Appendix A presents a number of graphs that make these changes clear. The visual representations of these shifts communicate the degree of change more starkly than any sentence could. These graphs are included in the current study as they represent the trends that a recycling center in Detroit would need to address. Instead of being developed outside of the city, it could take advantage of the vast open lots proximal to the central city, helping to offset the unmitigated flow of capital and development projects out of the city. Additionally, it would help to reverse some of the skills mismatch that currently exist between the jobs that are available in the city and the educational and professional attainment of those who actually live there by increasing the

number of industrial and lower-skilled positions available. Finally, returning to the idea of an equitable transition to the future, juxtaposing the graph of development by decade and racial composition change in the region, it is clear that development has not occurred where African Americans live. This is made more obvious by the final graph that attempts to visualize opportunity. Comparing this graph with the most recent visualization of racial makeup in the region is alarming. What emerges is a startling picture of just how racially unjust the Detroit area is. In light of this, the same traits of a recycling center that would help to counteract some of the trends towards capital flight and job spread away from the inner city would also help to make strides in terms of racial equity in the area, particularly as it pertains to employment opportunities.

The Politics of Decline

As previously mentioned, Detroit politics are associated withracial strife. However, beyond that, the city bureaucracy has long had a reputation for inefficiency and corruption, with the citizens of Detroit having little faith left in their government to positively impact their lives (Gallagher 2010). While external circumstances have not been kind to the city over the past half-century, the era of Mayor Young and subsequent leaders have been marked by a notable level of corruption and mismanagement. As Okrent puts it, Mayor Young "spent much of his 20 years in office devoting his talents to the politics of revenge…Detroit was dying, and its mayor chose to preside over the funeral rather than find a way to work with the suburban and state officials who now detested him every bit as much as he had demonized them" (Okrent 2009, 3). Some perspective is needed here, and Okrent (2009) paints a more nuanced picture, spreading the blame around to automotive industry leaders and their sidekick, the UAW who had become too

comfortable with the status quo, as well as leaders at all levels of government who were cozy with the auto industry and also enabled it pursue short-sighted strategies. Additionally there is some perspective needed with regard to Mayor Young as accounts of his time in office tend to be highly polarized; he inherited a difficult situation, one in which in many ways the suburbs had turned against the city. So while his militancy should perhaps be questioned, it does not discount the truth underlying this split. That said, the legacy of a Mayor who governed until 1997 through patronage and intimidation, and who was famous for his inflammatory quotes, cannot be ignored (Chafets 1990). One quote, from a 1986 interview with the Canadian Broadcasting Company is particularly telling as to the degree of antagonism that developed between Detroit and the rest of the state during the Young years:

> *CBC*: What would happen if you went door to door and started collecting all the guns?
> *Young*: Well, then people wouldn't have guns to shoot at each other. I have no problem with collecting all the guns if it is done like you do it in Canada. But I'll be damned if I'm going to let them collect guns in the city of Detroit while we're surrounded by hostile suburbs and the whole rest of the state who have guns, where you have vigilantes, practicing Ku Klux Klan in the wilderness with automatic weapons. I am in favor of everyone disarming; I'm opposed to a unilateral disarming of the people of Detroit. (Chafets 1990)

Most importantly, this legacy of the era of Mayor Young has impacted the ability of the state to work with other local governments and the State of Michigan, setting the tone for most debates as confrontational and as zero-sum contests between Detroit and everyone else. While the city has been successful in accessing federal funds, especially recent stimulus money for demolition and other improvement programs, its relationship with the State could hardly be worse. In fact, on April 4 the city avoided takeover by state officials when “the Detroit City Council passed a financial consent agreement Wednesday evening with a 5-4 vote, which grants the city the power to void contracts and slash costs but not provide state funding or loans to bail the city out of its

financial problems" (Isidore 2012). The city is $20.9 million in debt and the state has more or less forced the city's hand in terms of voiding contracts and other cost-cutting measures. While Detroit's finances are admittedly dire, it is hard not to see this as an abandonment of the city.

At a time when GM posted record profits, the city that made the region prosperous is being forced to extract savings from already struggling people. It is true that relative to comparably sized cities, Detroit has a proportionally very large bureaucracy. This is due to unprecedentedly rapid population loss, some of which has been driven by poor city services according to Mayor Bing (Detroit News 2011). This leaves the city stuck between a rock and a hard place; the loss of people due to poor city services and lack of good employment options is driving the calls for the city to further reduce its capacity to deliver services and to cut some of the few remaining decent jobs in the city. At a time when the city needs outside funds and engagement most, the region and state are hanging the city out to dry.

Even though the city has temporarily avoided the appointment of an emergency manager by the Governor, the future possibility of such a move is by no means off the table. This would have serious moral consequences in terms of racial equality and representation. Almost all of the state takeovers of municipal governments have been in black-majority localities, and the takeover of Detroit would add to this toll (Bukowski 2012). And regardless of the economic realities of the situation, this is being framed by many activists in Detroit as a matter of civil rights, as disenfranchisement of African Americans by whites (Bukowski 2012). Fanning the fire, Republicans on the state level are using false claims about an influx of welfare-dependent people taking advantage of the lack of a time limit on welfare benefits in the state to implement restrictions on benefits (Dickerson 2011). This is despite the fact that statistics show that Michigan has had one of the greatest decreases in cash-assistance program use in the nation,

driven by around 20,000 more people in a qualifying income bracket leaving the state than entering it between 2008 and 2009 (Dickerson 2011). It is tempting to look below the surface of those comments and see a continuation of false notions about the relationship of race and the work ethic.

On a more practical level, while politics are always cyclical and it is likely that conservative control in Lansing will not be permanent, it still presents a large impediment to any sort of regional infrastructural planning, especially an initiative like a recycling center which would require significant public funds at a time of extreme sensitivity to deficits.

Governor Snyder and the state have been framing the issue as a matter of creating an accountable and sustainable city government (Isidore 2012). While this is a noble goal, it is hard to imagine how broad budget cuts to a city already struggling to provide basic services to its residents will help in this regard. During the reign of Mayor Young, basic services such as public safety and schools deteriorated considerably, and government services in Detroit have a reputation for being inconsistent or non-existent (Chafets 1990). This has been especially true as Detroit has lost population, and emergency services are stretched thinner and thinner across greater empty expanses (Isidore 2012). In response, the Detroit Works Project, an innovative focus group and planning team was created by Governor Dave Bing. The intent of the program is to reassess what citizens want from the city and then to create both a short-term plan to deliver more services now, as well as a long-term plan to reposition the city for sustained competitiveness. The former has focused on reliable and responsive delivery of services (City of Detroit 2012). The recommendations of a nine-member panel responsible for addressing the latter will be released in June of this year (City of Detroit 2012).

This section has intended to lend some perspective on the forces that drove Detroit where it is today. The combination of a cash-strapped and less-than-efficient city government combined with a poor relationship with Lansing and a continuation of traditional urban-suburban divides, makes envisioning cooperative infrastructural investments difficult, but not impossible. Efforts such as the Detroit Works Project and others like Data Driven Detroit are emerging and lend some hope that more reasoned and evidence-driven voices are emerging to guide Detroit through what will surely be a difficult transition. In conclusion, I would like to present a few of the most salient economic realities of today in terms of challenges that Detroit must address through any development plan, as well as opportunities. The following facts come from materials released by the Detroit Works Project summarizing the current economic state of the city (Initiative for a Competitive Inner City 2011):

Challenges:

- Currently the city of Detroit and the Detroit Public Schools are the two largest employers in the city (13,200 for the former and 13,800 for the latter), followed by the Detroit Medical Center and the Henry Ford Health System.
- The private sector in the region has lost jobs at 2x the national rate during the recession
- Projections indicate that since 1998, the city has lost 3 of every 10 private sector jobs
- In August 2010, unemployment stood at 24.3% in the city
- The poverty rate in Detroit is 2x the national average
- Detroit has the worst case of job sprawl in the US by some measures with few jobs located in the central city

- The city lost 20% of its total jobs between 1998 and 2008, and likely considerably more since the financial downturn
- Transportation options for jobs located in the suburban ring are inadequate and many people in the central city live over 2 hours one-way by public transit away from high-job areas
- 20% of residents do not hold a high school diploma
- 33% of those residents without high school diplomas are under 45 meaning they will be a significant portion of the workforce for a long time

Opportunities

- A strong manufacturing industry
- Firms with manufacturing know-how including export and transportation logistics expertise
- Considerable transportation infrastructure that could be used to strengthen Detroit through greater integration with regional and global economy

Waste

Collecting and transporting trash and recyclables is a mammoth task. According to the National Solid Waste Management Association, the solid waste industry employs 368,000 people. They use 148,000 vehicles to move garbage to 1,754 landfills and 87 incinerators. They also pick up recyclables at curbside in 8,660 communities and take them to 545 materials recovery facilities for sorting. Solid waste is big business to the tune of about $47 billion in annual revenue. —Dan Kulpinksi, *National Geographic,* 2009

In order to begin a discussion of waste and innovative ways of handling it in our country we must first define this term, a term that has frequently proved vexing. In the first book to thoroughly examine the diverse patterns of waste governance around the world, *The*

Geographies of Garbage Governance, Anna R. Davies of Trinity College in Dublin explores the history of scholarly and policy thinking about waste (focusing on municipal solid waste) and also explains the way various governments and international organizations define waste.

As Davies writes, simply defining waste has been a struggle for many governments and international organizations. For example, the 1975 European Community Waste Framework Directive defined waste as "any substance or object which is discarded or which will be discarded" and this was then clarified into specific categories of waste as the term proved too broad for operational purposes (Davies 2008, 5). The OECD defines waste as "material products that are not prime products (i.e. Products produced for the market) for which the generator has no further use for own purpose of production, transformation or consumption, and which he discards, or intends or is required to discard" (Davies 2008, 7). The world of waste is a clearly complex one, with poorly delineated boundaries and far-reaching implications in the current era where waste, its reuse, and its disposal are becoming a more economically and politically important issues.

In the end, Davies (2008) moves forward with a well-reasoned definition that waste can be widely agreed-upon as 'materials that are residual to the needs of the individual, household or organization at a particular time and thus need to be disposed of' (73). However, this is a very broad definition and as we explore the current proposal it will become necessary to establish more specific types of waste, as waste makeup determines much of what you can do with it. For example, municipal solid waste can often be contaminated with hazardous waste, while construction and demolition waste—when collected properly—is generally purely non-hazardous.

Another important point established by Davies is that a governance perspective is much more relevant to the management of waste than simply a governmental one. This is because in most countries a variety of actors drive governance of waste, from multiple levels of government to the private sector, to public-private partnerships. To simply focus on governmental policy and responses to waste would lose much of the complexity of the reality on the ground. This is especially true in the US where the EPA drives national standards, but local municipalities and states are responsible for implementing them—often to varying degrees (Davies 2008). This creates a fantastically complex patchwork of different waste governance frameworks and policies. Additionally, in the US while these municipalities and states govern waste, the implementation is often left to private contractors through public-private partnerships who also meet standards to a varying degree.

Non-governmental actors are also important in agenda-setting and establishing the norms through which we view waste. In Detroit a number of organizations have popped up that are attempting to embrace this turning point in the city to embrace a more sustainable waste system, for example the organization Zero Waste Detroit advocates for curbside recycling and composting implementation, as well as protesting and advocating against perceived negative activities such as the city's incinerator (Zero Waste Detroit 2012).

Finally, some broader trends in views towards waste are worth touching on briefly. First, waste is becoming more important in OECD countries because of growing societal attention to issues of consumption and disposal (Mazzanti 2009). In particular there has been growing attention to the location and potential downsides of landfills, as well as their disproportionate proximity to low-income and minority communities, and this has led to a reduction in the number of disposal sites (Mazzanti 2009). This has large impacts on the average price of

disposal at landfills (tipping fees). Tipping fees have been increasing drastically, even during the recent financial crisis, and a record high of $43.99/ton was reached in 2010, a 6% increase from the year before (Waste Business Journal 2010), and this number is significantly higher in denser urban areas in the Northeast. This is due to consolidation of waste management firms, allowing more pricing power on the supply-side, but it is also a reflection of decreasing numbers of landfills and the difficulty encountered in trying to open new ones(Waste Business Journal 2010). It is also important to note that studies have shown that increased economic prosperity is NOT correlated with a reduction in waste generation (Davies 2008), however greater density does decrease collection and recovery costs (Mazzanti 2009). These facts indicate that we need to find better ways to recycle products and to achieve greater scale and density in our recycling systems.

Finally, a study conducted in Switzerland found when a broader system perspective is used—taking into account the economic and environmental impact of all aspects of waste collection, transportation and processing—found that while all forms of waste management have decided drawbacks but simple land-filling is always associated with loss of resources and value vs. recyling/composting or incineration (Eriksson *et al.* 2005). The authors write that:

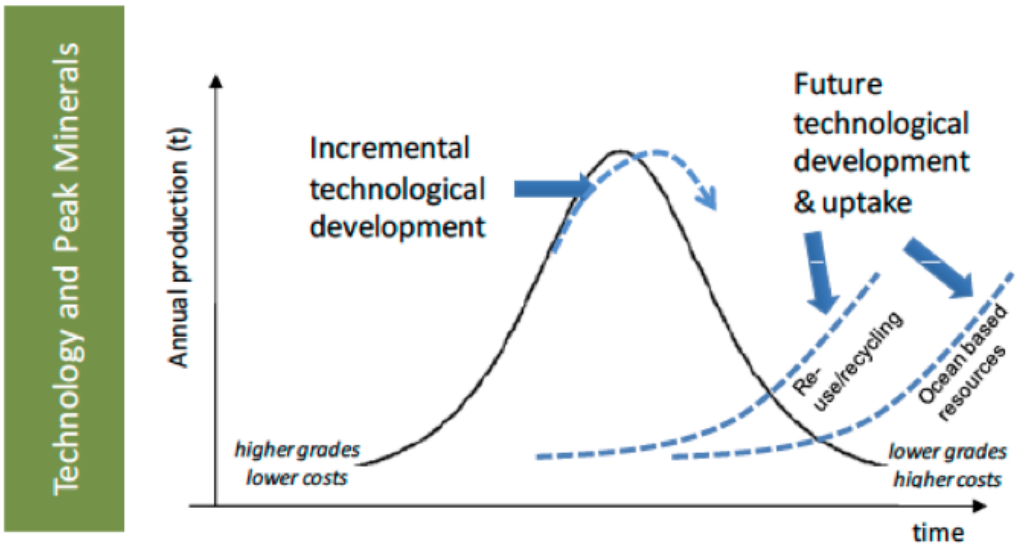
> The overall conclusion from the study is that as long as landfilling is avoided, several waste treatments are possible and they are all better with respect to environmental impact, use of energy resources and economy. A combination of anaerobic digestion (with an improvement of the spreading technologies in the agricultural sector), materials recycling and incineration would probably be the best solution to avoid landfilling as much as possible. This conclusion holds true if the options are seen as being of almost equal merit in terms of costs and environmental impact, and having a redundant system (not to stick to only one method) is a wise thing. (Eriksson *et al.* 2005, 251).

Ramping Up Recycling

While recycling at all levels needs to be ramped up, some products are currently handled more effectively than others. For example, paper, glass, aluminum and plastic bottles are all fairly widely recognized. In this section I will highlight two waste streams that are currently under-utilized and present a perfect opportunity for the entry into the market of an innovative recycling center.

Metals

The importance of non-renewable resources is gaining attention globally as we approach peak production for many minerals. While oil is clearly the most focused on reserve in this regard, of similar concern are also many metals. For example, the US reached peak production for many ores in 1971, and many other countries are expected to reach that point in the near future. At the same time consumption of these raw materials is increasing (Prior *et al.* 2010). Beyond simple depletion, this fact carries considerable environmental consequences because as the low-hanging fruit is removed, harder to access reserves must be utilized, and this often means more environmentally destructive practices, higher water use, and most likely will also mean utilization of minerals in the ocean floor (Prior *et al.* 2010). Addressing peak minerals will mean utilizing some of these harder to access stores, but it will also mean increased recycling will be necessary (Prior *et al.* 2010).



This figure shows the consequences of peak minerals for the mineral industry. As it shows, re-use and recycling will become increasingly important. (Prior *et al.* 2010, 13).

In a recent survey of the global recycling rate for 60 metals, it was found that only 15 metals (including obvious ones like gold) have recycling rates over 50% (Graedel *et al.* 2011). This same study identified several factors currently limiting recycling rates for metals. Among them are: the increasing complexity of many consumer goods which make disassembly harder; the long lifetime of many metal-containing products, which means that many products often have many owners and are highly mobile, making implementing policies that increase recycling rates more difficult; similarly, there are also issues with collection and centralization of recyclables, as many of the metals are in small, highly-dispersed items like personal electronics; and perhaps most importantly, the high availability of cheap and easily accessible raw reserves has limited the economic incentive to increase recycling rates and innovate new methods to increase what can be recycled (Graedel *et al.* 2011). That said, the authors hold that "despite the challenges of improving recycling rates, however measured, recycling generally saves energy and minimizes the environmental challenges related to the extraction and processing of virgin materials"

(Graedel *et al.* 2011, 364). For all of these issues it would seem that greater waste and recycling concentration in one location would allow for greater reclamation of under-reclaimed metals as greater scale was achieved. Not only does this save resources, but also as Jain (2011) explores in the Indian context, aggressive metal scrap and recycling programs can create a significant number of jobs. Additionally, if piggyback ventures to manufacture products using reclaimed materials began in Detroit, this concentration would streamline costs and likely further tilt the scales back towards recycling and reuse and against the environmentally hazardous exploration of more difficult to access mineral reserves.

It is also worth noting that due to thermodynamics, as well as the fact that some products are extremely difficult to recycle, 100% reuse will never be achieved, and this should provide a further impetus to aggressive recycling now. A 2010 study looking at the ability of recycling to create long-term sustainability in resource use found that first increases in total raw material use must be limited to 1% per annum—obviously a target which we are not close to globally—after which point a total recycling rate of over 80% would prove integral in achieving sustainability in resource use (Grosse 2010). While this same study is pessimistic about the role of recycling without reaching this 1% mark, it would seem that it doesn't matter which comes first, arriving at infrastructural capability in order to achieve 80% recycling or getting below that increased consumption mark—we must simply get to both in the not-too-distant future. Given all of this, it is shortsighted to continue with the rampant waste of reclaimable materials, when we can see peak minerals across the globe approaching and knowing that we will never reach 100% reclamation. It is irresponsible to not begin investing in new systems to achieve greater reclamation now.

Plastics

Plastics production is responsible for 4-8% of global oil use and 90% of plastics are manufactured using non-renewable petroleum (Al-Salem, Lettieri, and Baeyens 2009). Studies show that plastics account for 7% of the total waste stream in the UK and are increasing due to single-use plastics such as packaging and shipping materials (Al-Salem, Lettieri, and Baeyens 2009). Much of this must be dealt with through source reduction and reuse, and especially in areas like shipping there are very promising strides being made in terms of packaging reductions—and often by unexpected corporate actors such as Wal-Mart who is not only reducing their own packaging but also using their considerable leverage to transform their suppliers' practices as well (Bardelline 2008). However, as with metal ores, recycling will also have to be part of the long-term solution for plastic solid wastes (PSW).

Luckily there are some very promising innovations emerging. While rates for reclamation of PSW found in municipal waste streams is currently low, the reclamation of PSW from manufacturing (scrap) is much higher. And PSW collected is currently being used in innovative ways, such as the manufacture of clothing fabrics (Al-Salem, Lettieri, and Baeyens 2009). PSW recycling and reuse is currently limited by the variable quality of inputs as well as the limited marketization of recovered products, and quite simply the infrastructure needed to dramatically increase recycling rates is not there (Al-Salem, Lettieri, and Baeyens 2009). Given this, "the continued development of recycling and recovery technologies, investment in infrastructure, the establishment of viable markets and participation by industry, government and consumers are all considered priorities of the highest order" (Al-Salem, Lettieri, and Baeyens 2009, 2626). Another important take home message is that—particularly when dealing with the more ambitious types of plastic recycling that are emerging, such as gasification which can

produce high quality components of fuels—increased scale of processing facilities is required (Al-Salem, Lettieri, and Baeyens 2009). In concert with increasing scale, ambitious recycling targets and enforcement will be necessary to make these facilities feasible in terms of cost, quantity of input needed and to ensure their relative advantage over mechanical techniques, which can't handle the same variety or lower quality of polymers as chemical processes can.

In this section I have touched upon two separate waste flows that exhibit very different characteristics. Metal ores are some of the most commonly recycled goods in the current system, whereas plastics have proven a difficult problem to solve in terms of capture and re-use. However, both are in desperate need of ramping up, as is every aspect of recycling in the US. This represents an opportunity for an intervention in the business as usual approach. If a new recycling center in Detroit were able to process a greater range of plastics and metal ores, it would position itself for long-term financial success; as broader global trends require ever-greater reclamation of these two classes of item, there will be more and more demand for the unique services that this regional recycling center would offer.

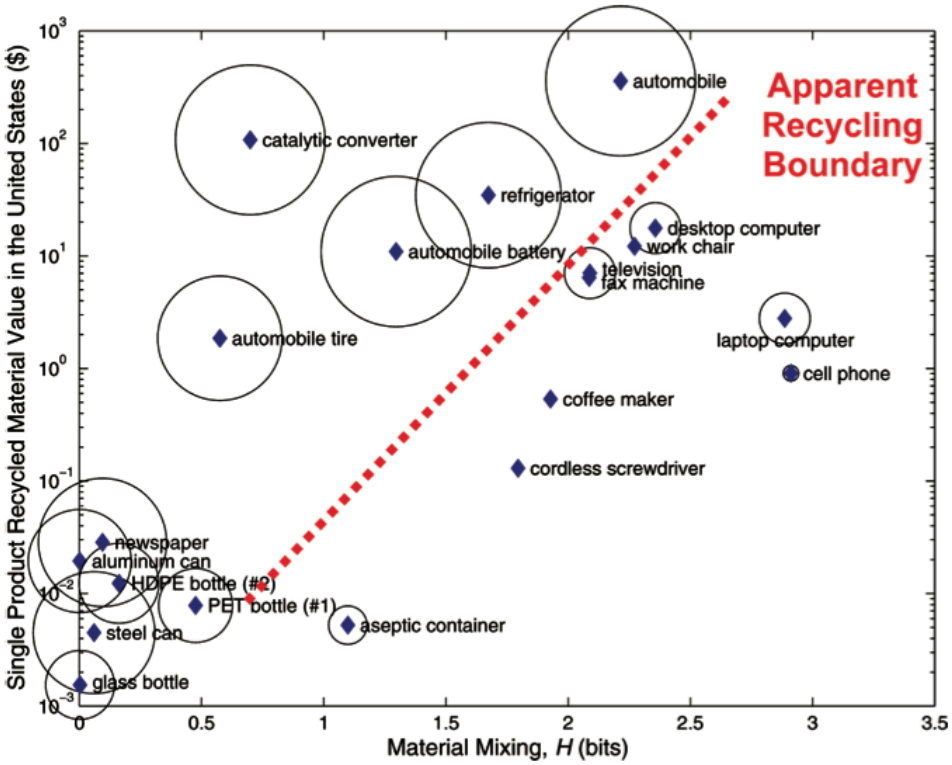


FIGURE 4. A plot of single product recycled material values ($\sum m_i k_i$), material mixing (H), and recycling rates (indicated by the area of the circles) for 20 products in the U.S. The "apparent recycling boundary" is shown.

This graph is a good representation of what needs to change. This represents the results of a study that used the current recycling system in the US to develop a metric to estimate and lay out what products have a viable recycling market (Dahmus and Gutowski 2007). Innovations in recycling policy and infrastructure need to be implemented to move the recycling boundary to the right. The potential gains of scale, as well as the opportunity to innovate new policies and markets, give the creation of a regional center in Detroit the potential to do just that. (Dahmus and Gutowski 2007)

Scale

One interesting note about the literature on waste is that while many call for the implementation of new technologies and improved policies to enable further recycling of a greater array of waste products, there is relatively little discussion of the issue of scale. At a time when increases of scale have revolutionized the way we get our consumer goods, this seems surprising. If we rely on ever-increasing scale for the manufacture of our goods, why not for their disposal? It is possible that redundant recycling infrastructure in many localities costs more

than shipping to a more centralized location would. For example, a recent report by CBI—a business lobbying group in the UK, where the government is rapidly increasing recycling, composting and energy-recovery infrastructure—argues that "wider adoption of shared services across local governments offers one of the most compelling ways to transform services delivered by authorities across the country. Opening up development of larger-scale waste treatment facilities, where there is potential to cater for joint municipal and merchant markets, can also provide value-for-money solutions" (Conboy 2011, 4-5). This same logic would seem to apply equally to the US, however more advanced studies need to be done to ascertain the ideal scale on which recycling would best be performed in the US in order to minimize costs, and maximize value returned from the capture and reuse of waste. As the same report details, municipalities must adapt their waste strategies to everything from regional variations in waste production to climactic conditions that can impact best disposal practice, and there is likely no one-size fits all management plan. There is also the possibility that if a framework were worked out in which Detroit could have a guaranteed flow of waste (as well as money for waste treatment services) from multiple outside sources, innovative new technologies could be implemented. For example, some advocate plasma gasification as a new and exciting form of incineration that generates more energy, creates less emissions and leaves only non-hazardous byproduct (Circeo 2008). It might be that if fully examined it could prove cost-effective in a more centralized system, and the same holds true for polymer recycling methods touched on earlier.

Transportation

An obviously paramount issue in trying to create greater centralization in the recycling system is the environmental impact of transporting waste to a centralized location. Part of the

rationale behind recycling is that, as an environmental intervention, it should not exacerbate other environmental issues. In this case, emissions from transportation are of paramount concern in terms of not increasing the carbon-footprint of waste disposal. In this regard, Detroit's true deepwater port and central Great Lakes location are ideal. As a recent report from the Saint Lawrence Seaway Development Corporation details, "The Great Lakes/Seaway System is also the most cost-efficient and environmentally responsible route to the midcontinent. Studies have shown that marine transport uses less fuel, has fewer emissions and is safer than either rail or truck for equivalent cargoes and distances" (3). A recent study by Comer *et al.* found that shipping through the great lakes and increased use of trains for transport present a much more environmentally friendly option for container shipping in the Midwest compared to movement by trucks, and these should therefore be incentivized through proper policy measures and a reconsideration of priorities (2010). As they conclude:

> Discussions of the competitiveness of rail and ship com- pared with trucks require understanding the tradeoffs as- sociated with any mode that is chosen. Trucks are often the fastest way to move containers but emit the greatest amount of CO2. Ships are often the cheapest way to move containers but have a relatively longer time of delivery, and some ships offer the lowest CO2 alternative at less cost than trucking, albeit with potential penalties in NOx or PM emissions. Environmental policy incentives to make ships more attractive and competitive with trucks must consider multiple performance metrics (e.g., not just time of travel) to incentivize freight transportation in the Great Lakes region by ship. (Comer *et al.* 2010)

Obviously, for the shipping of waste, time of delivery would not be the most important concern. Whereas, of paramount importance is the emissions generated through transport. Large ships would not be the only option, and shipping by barge is 300% more energy-efficient than trucks, it releases far less emissions, is the safest form of transport in terms of frequency of accidents, and just one barge can remove 60 to 90 trucks from the road.

The subject of transportation is particularly propitious for the current proposal as waste from many cities currently travels enormous distances to be landfilled. For example, waste from New York City is currently shipped as far afield as Ohio and Virginia, often by truck. When this is the business-as-usual approach, any alternative management option does not have to do much to demonstrate improvement in terms of carbon emissions and cost.

Additionally, various other changes could work in favor of shipping waste from Eastern Seaboard cities to Detroit. First, New York City is one of many cities that are desperate for better waste disposal options, and the Northeast is the most pressed region in the US in terms of price and availability of landfill options (Halfman 2009). So while New York is the go-to example for unsustainable waste systems, it is by no means alone in terms of large cities in the eastern US. Second, New York City is currently developing a waste receiving facility on the water to transfer waste directly from collection vehicles to barges for more environmentally-friendly shipping (Department of Sanitation New York City 2012). Other cities are likely to follow the NYC example in this regard. Third, both the New York State Barge Canal system and the St. Lawrence/Great Lakes Seaway System provide viable and economically feasible shipping routes from the East Coast to Detroit, and there is a push to increase the use of the New York State Barge Canal after shipping rates dropped dramatically fifty years ago (Tario *et al.* 2010). Finally, while it would need to be decided whether pure waste and recyclables would be sorted before transport to Detroit or after its arrival, even if it is sorted post-transport and significant amounts of waste that needs to be landfilled post arrival in Detroit, it will still be considerably closer to landfills with capacity than at its source point in the crowded Northeast, as Southeast Michigan currently has a glut of landfill capacity (Guyette 2011). A plan such as this would also provide many jobs for those involved in inland shipping in the US and potentially prove an

economic boon to some depressed communities along the previously bustling New York State Barge Canal.

I have focused here on the benefits of Detroit's port in terms of bringing in recyclables from the Eastern Seaboard as well as other cities with navigable connections to the Great Lakes, however, as Comer *et al.* explore, greater reliance on trains as opposed to trucks is also worth pursuing. Detroit, primarily due to shipping during the boom of the auto industry, also has a well-established train freight infrastructure that could be beneficially utilized. Renovations are currently underway on the train tunnel connecting Detroit to Windsor, Canada, to allow for more total cargo to be transported (Thomas 2012). This will increase trade and connections between Detroit and our neighbor to the North and there is no reason these connections couldn't extend to a recycling infrastructure. Whether by train or by barge or ship, if a large-scale recycling center in Detroit could prove to be a more efficient and cost-effective option for management of recyclables, there is no reason to think that cities north of the border wouldn't utilize the city's services in addition to US cities.

Waste Streams

The initial impetus for this project came from recognition of Detroit's unique struggles as well as the traits that give it a huge advantage in terms of reinvention, of embracing the opportunities of the future economy. One of those opportunities is surely the ever-escalating quantity of waste produced, particularly in the developed world.

The idea for creating a world-class, large scale, cutting-edge recycling facility in Detroit is an idea in its infancy. This, like the city itself, means that the plan can pivot and morph to take advantage of propitious circumstances. One of the most important factors that will set the tone

for the entire proposal and significantly influence the feasibility of the project is, as a whole, the type of waste to be processed. Options include all types of municipal solid waste (MSW), MSW minus organics, construction and demolition (C and D) waste, steel recycling to take advantage of synergies with the automobile industry, or most ambitiously, all of the above.

This section will outline the drawbacks and advantages of MSW and C and D, the tow types of waste that I think would be most feasibly processed in Detroit, and which are in great need of a disruption to the business-as-usual approach.

Compostables

This section will require the least exploration, as it is likely to be the least relevant waste stream for the current proposal. The idea of transporting waste from other cities to Detroit is likely to prove volatile enough without dealing with organic materials. These materials, which include food, yard waste and other organics are increasingly being recycled in municipalities across the country. However, the numbers of reasons against including organics in this system far outweigh the benefits. Organics degrade and are not particularly pleasant as they do. Additionally, organics composting centers tend to be located outside of populated areas, require significant space and would be unlikely to experience many gains from increases from scale. A compostable is just that whether it's being processed at the household or the city level.

This does not negate the need for a composting program to serve Detroit itself, and in light of the recent charter, which will be touched on later, and work by organizations like Zero Waste Detroit, it is increasingly likely that one will be. While it is largely irrelevant to the topic currently under discussion, implementing and sustaining a composting program in the city would likely be easier in a city mobilized around new recycling programs, and considerable synergies

would exist between a potential recycling program and complementary calls for broad expansion of urban farming championed by many thinkers.[6] If the city could create much of its own fertilizer through composting of organic waste, it would go a long ways towards reaching the ambitious target of being the most food self-sufficient city in the world, a goal advocated by Gallagher and others.

Municipal Solid Waste

In 2000, approximately 232 million tonnes of MSW was generated in the US, and of that 55.4% was landfilled, 23% was recycled and 7.1% was composted, an additional 14.5% was incinerated in waste-to-energy facilities (Barlaz, Cekander, and Vasuki 2003). In the EU, MSW generation doubled between 1990 and 2000 and continues increasing 3% year on year (Al-Salem, Lettieri, and Baeyens 2009). These are startling numbers and should be a wakeup call for all of us living on this decidedly finite planet, a wakeup call that something must be done to first halt the continued increases in MSW production, but then to find more productive reuse and recycling options for it. In terms of the current proposal, a perhaps more palatable option than MSW with organics or simply organics would be the processing of recyclables with compostables sorted out. While considerable non-recyclable waste could be processed using Detroit's large incinerator, there would little value in shipping non-recyclable MSW to Detroit. However, the hope and rationale, if some sort of regional MSW recycling center were to be implemented in Detroit, would be that the increased scale would alter the cost/benefit calculation for recycling many more types of plastics, minerals and and other wastes. Through scale, a

[6] For another advocate of urban farming in Detroit see (Dowie 2009)

market for far more waste types could be created than any individual municipality could achieve on its own.

A municipal solid waste system would seem, realistically, to be an option that would not be feasible until farther down the road. This is due to the incredibly complex mix of local and municipal waste governance regimes. It would require considerable coordination among cities, towns, states and the federal government to provide enough certainty that potentially interested participants in a regional MSW recycling center could plan ahead and make the transition to the new system. Currently, most governments contract with commercial service providers, and there would be considerable variance in expirations of the current contracts between different localities. Further, many of the systems currently in place, from landfills to incinerators, require significant initial investments and depend on a long period of service to payoff this investment. Just ask the people of Harrisburg, Pennsylvania, which has gone bankrupt in part because of crushing debt amassed from building, and attempting to maintain, a large incinerator (NPR). In the case of Harrisburg, proponents of the incinerator hoped that it would make the city a waste capital of the region, attracting business and money from other municipalities by under-cutting tipping fees (NPR). This hoped for outcome is obviously far from the reality of the situation, and the cautionary tale of Harrisburg should not be ignored. The world of waste is highly complex and any ventures that attempt to alter the current system bear significant risk. It is a good reason to approach MSW with realistic caution, but not to dismiss it.

Construction and Demolition Waste

Perhaps the most promising possibility is creating a regional center for the processing of construction and demolition waste. Construction and demolition waste has a number of

advantages over other waste forms, in that it is relatively uniform when compared to something like MSW, and it comes from relatively few point-sources. It is also fairly well regulated which means that effecting change in regards to C and D disposal would be a much easier process than with other waste streams. Additionally, it is a relatively large waste stream that is unlikely to be reduced significantly through improved production methods in the near future. This would ensure that the supply for a recycling plant would be relatively steady. Relying on regional waste inputs would similarly have benefits in this regard. As a recent study of the viability of C and D recycling facilities in Brazil determined, one of the primary factors ensuring the financial viability of these centers was the total volume a center was able to reach and the continuity of its waste stream (Nunes *et al.* 2006). Finally, the plummeting population of many Midwestern and Eastern Seaboard "rust-belt cities" means that there are significant amounts of standing housing, industrial plants and other buildings that need to be razed. This is particularly true of Detroit, and it means that a pilot program implemented to handle C and D waste could draw primarily from local sources to get started, before expanding to external ones.

C and D waste "normally includes but is not limited to dirt, stones, bricks, blocks, gypsum wallboard, concrete, steel, glass, plaster, lumber, shingles, plumbing, asphalt roofing, heating, and electrical parts," and both the public and the construction industry are concerned about growing shortages of raw materials and the environmental impacts of improper disposal (Huang *et al.* 2002, 24). In terms of C and D wastes, there are a few methods to raze buildings that impact the waste stream and its quality. First, there is simple demolition and landfill. This has the lowest initial costs, but has no potential for reclamation of value and the highest environmental impact. Next there is demolition and then mechanical recycling of materials to create a fine substrate that can be used in construction infill and in things like concrete for road

construction, so there is considerable room for reclaimed reclamation (Merino, Izquierdo Gracia, and Weis Azevedo 2010). Currently, aggregate derived from such methods makes up a small fraction of total aggregate used in infills and in concrete used in constructions (Merino, Izquierdo Gracia, and Weis Azevedo 2010). This not only reduces use of virgin materials as aggregate, but it also reduces total flows to landfill. Another general advantage of C and D waste is that it is generally inert. One important note is that, generally in the current literature, the trend is towards greater decentralization of C and D waste processing, with small transportable mills being used for on-site reclamation (NAHB Research Center 1999). This is due primarily to the expense of transport to a recycling facility.

However, currently there is little coordination among construction and demolition sites, let alone among municipalities and states. If a system such as weekly pickup in each locality by a dedicated barge or train could be established—where transportation in-mass using low-emission methods of transport could be harnessed to reduce the relative cost of transportation, it is possible to envision a more economically viable system of greater centralization. Greater centralization seems particularly important if any use other than simple creation of aggregate were to be developed to make more creative use of this waste stream. In this case, increased scale in a regional center would be more likely to generate the incentives that could foster these creative innovations and uses.

A more environmentally ambitious plan than simply creating a recycling center to spit out reclaimed products like aggregate would be widespread deconstruction and reuse of reclaimed products. There have been some very promising trials done in this regard. For example, a deconstruction of two WWII era buildings in the Presidio, a former army base National Park Service unit in San Francisco, managed to recover over 90% of the wood for

reuse, and the difference between labor costs and resale value of recovered products was only $10,000 which was made up through avoided demolition costs and landfill fees (Anon. 2002). Currently in Detroit there are also some promising ventures in this regard, including the Architectural Salvage Warehouse of Detroit, an organization dedicated to the deconstruction of houses and resale of reclaimed products. These types of ventures require more care in deconstruction and training, however they have the potential for much greater returns. Whether a broader, centralized salvage center that served cities beyond Detroit could be implemented deserves further consideration. While it would require significantly more cooperation and standardization of procedure among demolition firms, much greater logistics coordination, and the creation of a market to sell the reclaimed products to a broader market, it would seem to have even more potential returns than the basic reclamation methods touched on previously.

Regardless of the C and D reclamation technique implemented, the uniformity of abandoned housing stock in the region would likely make the implementation of such a plan much simpler, as inputs and reclaimable products would be relatively consistent. Currently, building deconstruction in the US is increasing, being driven by government regulation, concern by all parties about environmental impacts of waste creation, and a recognition by contractors that deconstruction and salvage can have considerable economic benefits (Anon. 2002). However, what is lacking is a centralized, reliable and uniform market for these products, and an infrastructure to deal with them. The creation of such a center in Detroit would satisfy this need and might go a long ways in terms of catalyzing more sustainable use of abandoned buildings in the rust belt, an enormous project touched on later.

Waste Recovery from the Built Environment: Building Reuse and Demolition Waste as a Resource

Standing derelict buildings are a problem across much of the rust belt. However, nowhere has this issue been more visible than in Detroit, where it is one of the major factors contributing to the city's struggles. Abandoned properties not only pose a safety risk, as they breed crime, lure squatters and looters, and can be the target of arson, but studies have shown that they depress neighbors property values (Gallagher 2010). Detroit is following the example of other cities like Philadelphia that have been relatively successful in addressing the problem. It has some innovative programs, formal and informal that are tackling the problem, such as groups that simply fence and maintain gardens in abandoned lots, or neighbors taking over adjacent properties to form urban gardens. However, most people think that, in the end, demolition is the only answer long-term answer for the city. That said, as a recent Detroit Free Press article details, the city is currently too cash-strapped to demolish just the abandoned properties deemed dangerous——some 33,000—let alone all the derelict buildings currently blighting the Motor City (Dawsey and Tanner 2012). That said, placed in a discussion of the possibility of establishing a C and D facility in Detroit, these same buildings might move from a liability to an asset, providing a guaranteed starting flow of waste for processing.

Students walk by an abandoned house and an illuminating sign. More than 5000 of the properties deemed "dangerous" by the city are found within 400 yards of a school (Dawsey and Tanner 2012). (Photo credit: Andre J. Jackson/DFP)

To begin exploring the problem, it is important to differentiate between the types of unused buildings present in Detroit. First, there are old factories and other industrial buildings, and second there is a significant amount of abandoned housing stock. A recent sarcastic blog post on *Fangraphs.com,* a blog dedicated to baseball, is good evidence of how deeply felt the housing crisis in Detroit is. Writing about opening day, author Robert J. Baumann suggests, as an example, that the Cleveland Indians would be "setting the Cuyahoga River on fire again to 'recapture the glory days'" (Baumann 2012). Meanwhile, for the Tigers he writes:

> "opening day is "House Deed Day" to the first 10,000 fans through the gates at Comerica Park: deeds are for one of the many available houses throughout greater Detroit. One lucky fan will receive the deed for Michigan Central Station. Casino vouchers will be provided to the rest of the sell-out crowd; fans can also sign up for a chance to win the responsibility of paying Prince Fielder's salary" (Baumann 2012).

This, on a national blog, indicates how deeply Detroit's abandoned building woes have penetrated not just the city's consciousness, but the Nation's psyche as well. In this way the post, while humorous, is also illuminating, complete with a reference to the city's dubious finances—a particularly pertinent problem as it is closely tied to abandoned buildings and houses.

Non-residential Buildings

The aforementioned post is also unintentionally pertinent as it distinguishes between the old industrial relic that is Michigan Central Station and general housing stock. Ironically, it is the latter that may prove to be a harder long-term fix than the thousands of run-of-the-mill abandoned houses. As explored earlier, Detroit experienced a dramatic boom in population and production between WWI and the post-WWII personal automobile boom. This meant that during this era large numbers of houses were thrown up at a breakneck pace. As Gallagher (2011) explores, this means that while there are some regal neighborhoods and some very nice Craftsman-style houses in Detroit, these tend to be the exception to the rule of somewhat haphazardly assembled wood-frame homes. To address this problem the consensus appears to be that, one way or another, they must be taken down. However, dealing with industrial properties such as Michigan Central requires a more nuanced approach. Some experts, such as MIT's Dennis Frenchman argue that even though there are many costs associated with attempting to remodel or refurbish historic buildings such as Detroit's Michigan Central Station, demolishing is in fact an asset-diminishing prospect (Carola 2012). As he asserts, "to tear it down is not a solution. In fact, you'll actually have fewer assets after you've done that, even if it's an old mill that's falling apart" (Frenchman qtd. In Carola 2012). In lieu of destruction, owners, cities and

concerned citizens are looking into alternate uses for the rust belt's plethora of decrepit industrial buildings.

Among the uses other cities are exploring are the conversion into a rental space for special events such as concerts or weddings; remodeling into residential space; and repurposing abandoned properties as incubator-spaces for business start-ups (Carola 2012). This final approach is one that holds considerable promise for Detroit, a city with significant quantities of handsome, if dilapidated, buildings coupled with an established and growing entrepreneurial base anchored by institutions such as Wayne State University (Gallagher 2010). The entrepreneurial landscape of Detroit, particularly with regards to potential for linkages with recycling systems and their outputs, will be explored later.

The Relics

A brief exploration of some of the now-abandoned buildings that adorn Detroit gives a better idea of the state of buildings in the city. It will also help elucidate the forces that have aligned on either side of the demolition/restoration debate, and the challenges that both sides face. Author and Detroit native Dan Austin documents some of Detroit's most prominent relics in his book *Lost Detroit: Stories Behind the Motor City's Majestic Ruins*. And as the title suggests, while many have focused on the buildings themselves, Austin goes further and explains the stories and history behind these buildings. This illuminates one of the other primary rationales for not simply demolishing non-residential structures; these are physical evidence of Detroit's boom-years, testaments to the city's not so distant glory, and from a morale perspective their destruction would send a clear message of defeat. From a historical perspective, many are gems that tell a fascinating story of the Motor City's glory, a story that deserves preservation in

physical form. For example, the Broderick Building, one of the tallest abandoned buildings in the US until its recent renovation, was once the home of a plethora of flourishing medical and dental practices before those tenants fled for the suburbs. Now the building, which features sweeping views of downtown from its upper-floors, has been repurposed as upscale residential units located in a still-vibrant part of the city (Zemke 2012).

Another famous Detroit institution, Cass Technical High School—responsible for the education of many greats, including Diana Ross, Jack White and Lily Tomlin—did not meet such a fortuitous end. Many called for the remodeling of the enormous abandoned school into a community recreation, fitness and arts center—it had three gyms, a swimming pool, and a 3000-seat auditorium with perfect acoustics—and a preservation society was even created to explore and implement this possibility (Austin 2010). However, in summer 2011 final demolition of the building was completed at a cost of around $3 million to the city, and likely with no materials being reused or recycled (Austin 2010).

The rationale behind demolition of Cass Tech is a familiar one in Detroit. While their was a preservation society that wanted to renovate the historic site, the city grew frustrated with the timeline and held that it takes more than desire to reclaim a building (Austin 2012). Meanwhile the building suffered extensive vandalism, and a 2007 fire damaged much of the interior.

This is a common story in derelict Detroit buildings. Vandals or scrappers enter abandoned buildings illegally, starting fires and reducing the desirability of nearby occupied homes and buildings. The Packard Plant is a prime example of this. No progress towards demolition has been made on the sprawling facility, even though a contractor was hired to do just that earlier in the year (Kaufman 2012). Instead, new entrances are continually being torn out of

the building's sides (some large enough for cars to drive into the facility for scrapping), and bridges between buildings in the compound have collapsed, as their metal supports are salvaged illegally (Kaufman 2012). Another illustrative example is a recent incident in Michigan Central Station in which one man in a group that was trespassing on the property fell through the floor and became trapped (Woods 2012). These cases demonstrate the primary argument for demolition: without money to maintain or secure these facilities they become a safety risk for those who enter them, and in many parts of the city fires that start within these buildings have the potential to spread to non-abandoned ones. This, combined with the perceived depression of surrounding property values, provides a powerful political argument for demolition, especially in a political climate where short-term fixes provide instant gratification—something for politicians to point to—and the needed stability and vision to think more long-term is largely lacking.

However, as the image below displaying Cass Tech in relation to downtown makes clear, it is hard to imagine how another patch of dirt could increase property values in comparison to a standing historic building—even an abandoned one. While there have been a number of studies that show that residential properties increase in value when proximal derelict houses are demolished or maintained (Gallagher 2011), the applicability of these studies to the situation made stark through the above picture of Cass Tech is questionable at best; most are based on residential blocks where one or two properties are abandoned and reduce the desirability of other houses in the area, whereas many of the regions in which these historic buildings are being torn down have no neighbors to impact. In fact, given the previously explored problem of vacant land throughout Detroit it is hard to see why this is an argument that holds any water. Previous efforts by the city to demolish vacant structures in the vain hope that it would spur development have created some of Detroit's most gaping expanses of emptiness. For example, the I-94

Industrial Park project intended to encourage new businesses to move to the city created a 189-acre vacant lot in the middle of Detroit. As Gallagher pithily points out, this "build it and they will come" approach has created a site that, apart from the one building that was built, "remains awesomely empty" (Gallagher 2011, location 403). More useful might be to spend the millions of dollars used on demolition to secure historic buildings that might some day be used in a more beneficial manner, a process that Mallach (2012) terms "mothballing." A city orienting to the future would, in this sense, be well advised to preserve some of its past. Support for this position is constantly being strengthened by an increasing number of relevant success stories. For example, the city of Dearborn plans to move city government to more modern confines and the old city hall will be turned into live-work space for artists by the non-profit Artspace Projects Inc. (Katzenstein 2012). Similarly, and even more relevant to the current proposal, Wayne State University just announced plans to build a new $93 million biotech facility off of the old Dalgleish Cadillac building (Henderson 2012). This facility will house hundreds of researchers and be partnered with Wayne State as well as a number of area biotech institutions and TechTown, an innovative incubator for startups that will be discussed later.

In the interim—as Detroit's political and economic circumstances hopefully continue improving to the point that more ambitious renovation projects can be undertaken— creative uses could be found for more secure and well-managed vacant sites. If these large abandoned buildings could be secured, use of interior products might well prove profitable. The current relationship between a city (or owner) too cash-strapped to effectively secure these facilities, combined with economic forces driving scrappers (or others) to enter illegally is a toxic one—increasing crime, decreasing salvage of materials, and drawing the ire of impacted neighbors. When the value of scrap (visible through its current exploitation), and the potential of many other

items simply left in these buildings at the time of abandonment is[7] taken into account, it becomes clear that there is a highly-exploitable niche waiting for a market intervention. Whether this could be an organized scrapping operation working in concert with the city and other property owners—and in so doing providing income to secure these same facilities against unlawful and unsafe —or a commercial venture that takes advantage of the popularity of vintage furniture and household items, that could reclaim and restore items and leverage the internet to sell nationally, there are many potentially fruitful avenues to be explored. Obviously, no one fix will prove the silver bullet that solves Detroit's abandonment issues. This does not mean, however, that there is not more innovative territory between demolition and immediate restoration. In the middle there may be a cocktail of minor interventions that could at the very least make incremental improvements on business as usual in the city, such as the ideas floated above. In addition to creating some funds to secure sites, these programs could also provide jobs and interesting niche markets for startups. While demolitions may prove more politically feasible in the short-term by appealing to a populace tired of what they see as a do-nothing city government, the city should hedge their bets by finding creative interim uses, or at least securing buildings and waiting for better times to reclaim the city's glamorous past. In the end, wholesale demolition of large buildings that are still structurally sound is an asset-diminishing course of action, and further "mothballing" should be prioritized.

[7] For example, administrators of a cash-strapped school district took heat for all of the desks and other materials simply left in Cass Tech (Austin 2012).

An example of an all-too common sight in Detroit's abandoned sites, this from inside the demolished Cass Tech. Materials which were abandoned along with the building, and are either left to go down with the building or taken by illegal looters or scrappers. Or in the worst cases burned through arson. (Photo credit: Elizabeth Beale for HistoricDetroit.org)

These science supplies inside the old Cass Tech provide another example of the type of materials and resources that could be better utilized through a more coherent system for dealing with not just the skeletons of abandoned buildings, but their interior trappings as well. (Photo credit: Dan Austin for HistoricDetroit.org)

This photo of Cass Tech looking towards Downtown not long before its demolition shows the current desolate state of parts of downtown Detroit, and it also gives a sharp visual of how central the famous educational institution was to the heart of the city. (Photo credit: Paul Hitz for HistoricDetroit.org)

The Broderick Tower undergoing renovation. (Photo credit: Mark Hall for HistoricDetroit.org)

The Federal Building circa 1913. The federal building paints a dissimilar story to most here as it was a victim of too rapid growth, not decline. Described in a Dertroit Free Press Article as one of the most beautiful in the US during its time, the massive building became too small to house the federal government's beauracracy—including rapidly expanding postal needs—after only a few decades of service. The building was demolished in the early 1930s (Austin 2012). However, while dissimilar in terms of the impetus for its demolition, the Federal Building has much to teach in terms of dealing with today's abandoned buildings. The stone from the Federal Building was reused in numerous projects, including Detroit's Zion Lutheran Church, built primarily from the salvaged stone (Austin 2012). (Photo credit: HistoricDetroit.org)

This photo shows the Book-Cadillac hotel, a success story that many hope will be a linchpin for redevelopment of the Washington Boulevard area. After decades of abandonment and attempts to rehabilitate it, it was finally restored and opened again as a luxury hotel in October, 2008. (Photo credit: Mark Hall for HistoricDetroit.org)

The beautiful but dilapidated interior of Michigan Central Station. (photo credit: themotorlesscity.com)

Residential Buildings

This discussion of non-residential abandoned buildings demonstrates the complexity of any effort to recycle the motor city. There will be no quick fix; instead a variety of creative methods to better reuse standing buildings would serve the future of the city. However, the question remains how these buildings impact the implementation of a C and D recycling program in Detroit. It is possible that success stories like the Broderick Tower or the David Whitney

building (which is set to be renovated with commercial space and a hotel) will become the norm moving forward, and that the Michigan Centrals and Cass Techs will become the exceptions. In this case, waste from these old industrial buildings (which consists of very different base materials then residential builds) would make up a very small portion of the recycling stream. And if the buildings are torn down, the combination of unsafe working conditions in some of the buildings and city budget constraints will likely preclude much material reclamation. Given this, we can guess that little recyclable or reusable materials will be generated from old industrial or commercial sites and our focus should instead be on turning the thousands of empty homes in Detroit—as well as the region more broadly—into a value-producing proposition.

As established earlier, Detroit has a significant housing stock left from rapid expansion of residential capacity during the boom years. However, much of this housing was shoddily assembled and is no longer satisfactory. In light of this, thousands of houses will need to be demolished or deconstructed. While this uniformity of housing from the post-war era makes it relatively unappealing to live in, as touched on previously it could prove highly beneficial in terms of a salvage or recycling center, as uniformity is always a positive in these endeavors. Beyond Detroit, this uniformity is the norm across much of the rust belt and would prove useful in the expansion of a facility to serve the broader region. As Mallach (2012) examines, while cities have attempted to deal with surplus buildings through demolition, decreasing demand driven by population loss has far outstripped this attempt to deal with the problem. This means that there is a considerable problem of standing housing and industrial stock in what Mallach terms "legacy cities," a euphemistic term for what I have referred to as rust belt cities. The following figure shows the quantities of abandoned structures across a number of legacy cities. All of these cities lack funds to demolish the quantities of buildings that would be necessary to

stabilize the markets, and some disruptive market force must emerge to change the price calculation of removing these buildings. It is my hope that a regional C and D waste management facility in Detroit could prove to be this force, changing the cost/benefit calculations for cities across the rust belt at the same time as reducing waste sent to landfill and creating jobs.

Table 1: *Change in Housing Inventory and Utilization in Six Cities 1990-2010*

City		*1990*	*2010*	*% Change 1990-2010*
Detroit	Total Units	410,017	349,170	-14.6%
	Vacant Units	36,170	79,725	+120.4
	% Vacant	8.8%	22.8%	
Dayton	Total Units	80,370	74,065	-7.8%
	Vacant Units	7,700	15,661	+103.4
	% Vacant	9.6%	21.1%	
Cleveland	Total Units	224,311	207,536	-7.5%
	Vacant Units	24,524	40,046	+63.3
	% Vacant	10.9%	19.3%	
Youngstown	Total Units	40,885	33,123	-19.0%
	Vacant Units	3,763	6,289	+67.0
	% Vacant	9.2%	19.0%	
Pittsburgh	Total Units	170,159	156,165	-8.3%
	Vacant Units	16,676	19,948	+19.6
	% Vacant	9.8%	12.8%	
Scranton	Total Units	35,357	33,853	-4.3%
	Vacant Units	2,720	3,784	+39.1
	% Vacant	7.7%	11.2%	

Source: U.S. Bureau of the Census

(Mallach 2012)

Current State of Recycling in Detroit

Detroit currently has very limited array of products that are recyclable and a very limited collection infrastructure in place. There are a number of drop-off locations for recyclables, and the city has recently implemented a trial curbside program in a couple of neighborhoods. However, it should be noted that in addition to limited recycling systems in place, the variety of products that are recyclable in Detroit is low compared to comparably-sized cities.

One area worth further exploration in terms of the city's waste infrastructure is the city's incinerator, which has been a point of contention for years. It is the largest incinerator in North America and it is economically very inefficient (BioCycle 2008). Curt Guyette, a Metro Times Editor, said in 2008 that "by some estimates, Detroit's decision to turn its garbage into smoke and ash will have cost $1.2 billion by the time the incinerator is finally paid off next year" (qutd. in Biocycle 2008b). This is due to an initial cost of $438 million and then environmental retrofits, in addition to costly disposal fees charged by the operator for the city to use the facility. In 2008, Detroit paid $172/ton of waste disposed, a very high rate (BioCycle 2008). However, less than half of the total waste burned at the city comes from the city, and some private haulers under the previous contract paid as little as $12/ton, because the city was contractually required to provide a minimum quantity of waste, and it had to entice outside producers to meet this quota (BioCycle 2008). As Guyette sums up the situation, "in essence, Detroit residents pay a subsidy to burn other people's garbage and breathe the smoke it produces" (qutd. in Biocycle 2008). Given this, it is not surprising that the facility has generated considerable controversy. Despite the high costs and protests organized by environmental health advocates and organizations like Zero Waste Detroit, the city's contract with the plant was renewed, and the city is once again locked into a long-term relationship with the incinerator (Guyette 2011). As Guyette explores in an article published in the Huffington Post, many contend that the incinerator would not be

viable without continued public funds, the most recent of which was a $4.1 million brownfield tax credit given to the operators of the facility, Detroit Renewable Power (Guyette 2011).

While the incinerator has been first and foremost an impediment to the implementation to broader recycling in Detroit—Guyette (2011) compares Zero Waste Detroit and their fight for recycling, and against the incinerator, to Sisyphus, and this latest public funding is just the boulder rolling back down the hill—in the context of a regional recycling center the incinerator could prove a boon. As touched upon previously during the discussion of transportation infrastructure, one potential is that significant amounts of non-recyclables could arrive in Detroit along with the waste that could be reclaimed. If the city ramped up its recycling as well, as is required by the new city charter, a void would need to be filled in terms of waste sent to the incinerator, a void that could be filled by non-viable waste arriving in Detroit from other areas. This would seem the perfect way to take advantage of the presence of North America's largest waste incinerator, fulfill the city's long-term contract with the incinerator, and take full economic advantage of all waste products that arrive in the city. Even though there is considerable landfill space in Michigan, given the contract with Detroit Renewable Power and the enormous investment the city made in the plant not long ago powering downtown Detroit's innovative district energy system using the waste that was not usable in scaled-up regional recycling center would prove especially beneficial to all involved.

Chartering a New Course

The Detroit Charter Commission's proposed new city charter, which came into force in 2012, includes a section that mandates the implementation of a complete curbside recycling system for the city (Detroit Charter Commission 2012). Currently the majority of waste

collected in Detroit is burned through incineration at a controversial downtown plant. The new charter orders that:

> The Department of Public Works shall prepare, implement and update as necessary a comprehensive city-wide Recycling Plan ("Plan") for the City of Detroit that provides for the capture of the City's waste stream prior to disposal. The Plan shall be submitted to City Council for approval before implementation. City Council shall enact any ordinances necessary to achieve the objectives of the Plan and this section. (Detroit Charter Commission 2012, 29)

While vague and by no means a certainty given the financial and political state of the city, this is an encouraging development as it at the very least indicates a new awareness of, and priority given to, recycling in Detroit. In contrast, a 1996 charter (well into the era of waste-consciousness) contains no mentions of recycling. And while the idea creating a large-scale regional recycling center in a city without its own recycling infrastructure initially sounds crazy, it may in fact provide the perfect opportunity.

And as established, the incinerator, a regional recycling center, and a push for broader recycling for Detroit itself would all complement each other perfectly. This means that regardless of whether the focus of the new center was C and D—which I would suggest as the most logical starting point—or MSW, the city could plan their own system in a way that it could function in concert with the system serving the broader region. This would reduce unnecessary redundancies and also lower the initial investment in the project both for the infrastructure serving the city and for the regional processing plant.

Seen in this light, Detroit's current lack of a robust recycling infrastructure is not an impediment but an enormous advantage in an attempt to implement an innovative and forward thinking regional system.

Startups and Spinoffs

Another exciting aspect of a regional recycling center is the array of startups and spinoffs that could be leveraged by the creation of a regional recycling center. These would obviously be impacted by the size of the recycling facility, what inputs it handled, and most importantly what kind of reclaimed products it produced. In light of this, it is hard to speculate about the exact form these ventures would take. However, it is possible to explore some broader trends with startups in Detroit. Detroit's economy has been particularly damaged by its previous reliance on a few enormous vertically integrated corporations to power the city's economy (Initiative for a Competitive Inner City 2010). This is a model that the city will surely want to avoid in the future, and a strong startup culture is evolving in Detroit (Gallagher 2010).

This has in large part been driven by emergence of information technology and biotechnology firms. Key in this has been the utilization of the city's rich institutional resources, such as Wayne State University. A perfect example of this is Techtown. A business incubator and entrepreneur training center, Techtown is located directly north of Wayne State and has utilized this proximity effectively (Schmid 2012). Techtown, founded in 2007, estimates in a new report that they've helped 647 companies get started, that these companies have created 1,085 jobs, and that supported companies and alumni generated $41 million in 2010 (Schmid 2012). On top of this, success stories such as the $93 million biotech center at Wayne State mentioned in the previous discussion of abandoned industrial buildings, add to the sense that entrepreneurship and opportunities in the new economy are taking off in Detroit. This new facility is expected to house hundreds of researchers and to breed innovation and spinoffs (Henderson 2012).

This emerging entrepreneurial culture and positive environment for startups developing in Detroit bodes well for the potential for similar endeavors building off of a recycling center. Additionally, the willingness of Wayne State to work with outside institutions makes it possible to envision exciting synergies and partnerships between educational institutions and a recycling facility. These could include training programs for all levels of employees needed in the operation of such a facility. Continuing this line of though, it is also possible to envision that, the increased scale of a regional facility proved beneficial, that the concentration of expertise in Detroit could lead to programs that exported skilled labour in the operation of large-scale recycling facilities to other regions implementing similar programs. This is a very exciting possibility, as the city currently relies almost entirely on imports for its skilled labor positions—exporting skilled labor elsewhere would be a refreshing change.

A Benefit and a Barrier

Many benefits and barriers have been touched in the discussions of individual aspects of the proposal. However, here I would like to highlight two important additional considerations. First is the potential job creation from the recycling center. A recent literature review conducted by Cascadia Consulting Group (2009) found that nationally the recycling industry has been increasing its share of the labor market and provides more jobs at a higher income level than landfilling or incineration. Additionally, studies have shown that "employment per ton of material recycled has been reported to be almost ten times greater than employment per ton of material disposed" (Cascadia Consulting Group 2009, 2). Also worth noting is that the review found that recycling is viewed as a relatively safe investment and is increasingly attracting private capital (Cascadia Consulting Group 2009). Looking at this, it is easy to see that a

recycling plant in Detroit might be an easier sell than might initially be thought. The prospects for good job creation at varying educational attainment levels is obviously a huge plus given our previous exploration of Detroit's unemployment struggles. And the fact that private capital is increasingly being drawn to recycling ventures indicates that the city's tanking finances might not preclude a considerable infrastructural investment in recycling.

While these are both highly encouraging considerations, a caution raised by John Gallagher in a personal correspondence about the regional recycling center idea is less optimistic and deserves mention. Gallagher (Gallagher 2010) confirms the availability of plenty of abandoned warehouses and space for the creation of a recycling infrastructure, as well as the potential of Detroit workers to serve productively in a new recycling industry. He writes that there are: "plenty of industrial workers here who could serve productively in a new industry like [recycling]. We still make a huge variety of industrial products here in Michigan, and the tradition of industrial work here runs very deep, dating back to the late 1800s, when Detroiters made railroad cars and stoves and a lot of other things before they made cars and trucks." However, he voices concern over the way such an undertaking would be viewed, writing that:

> The biggest obstacle by far is the political one. To put it bluntly, no city wants to be known as the dumping ground for the nation's garbage. Whatever benefits Detroit might gain from such an arrangement, the stigma of being known as "garbage city" would make winning approval of such a scheme very, very difficult. That the solid waste would come from the east coast raises the additional image problem of New Yorkers using Detroit as their dumping ground. I'm sure most Detroiters would tell New Yorkers to take care of their own garbage. The sense that Detroit is so abandoned that it's only good for solid waste disposal runs counter to the city's image as a city on the rebound. (Gallagher 2012)

As he concludes, while the plan outlined here could have numerous benefits for the region and the technical aspects could likely be worked out, it is the political hurdles that would likely be the highest. And this is an important note for anyone that might continue with the idea. From

the beginning, the branding of such a development would have to be very savvy, focusing on the benefits to the region and the ways in which it was embracing the future economy and pacing the country in green industry, and it would need to skillfully address these concerns about becoming the "garbage city." Because, while some will inevitably see it as becoming the garbage city, it is much more a recognition of Detroit's unique strengths and latent potential, the acknowledgement that no other city is better-positioned than Detroit to revolutionize the scale at which we recycle, and in turn the waste system in the US more broadly.

Conclusion

In this essay, I have tried to lay out what I see as the best arguments behind creating a regional recycling center in Detroit. Such a project could create jobs in the central city that would cater to a wide range of employees with varied educational and career attainments. If my hunch that increased scale could revolutionize the recyclability of many materials were to hold true, the center could also improve recycling rates in the US and act as a catalyst for broader change in waste management practices in the region. If the system were to focus on MSW from the beyond Detroit's borders, it could find efficiencies with the city's own upgrading of its recycling infrastructure, as well as with North America's largest waste-to-energy incinerator. If the plan were instead adapted to process C and D waste primarily, it could prove a game-changing force in addressing not just Detroit's abandoned building problem, but the rust belt's more broadly. If the plan were implemented it could go a long ways in terms of breeding startups that could make productive use of reclaimed products, using them in interesting and new ways. If such a facility were built in Detroit, the city—now a symbol of decay and loss—might rebrand itself as a center of cutting-edge technology and unparalleled knowledge in the waste

industry, an industry that will only gain importance in the future economy. If, if, if. Any reader will notice the prevalence of this word in not just this conclusion, but in the study as a whole. This is a reflection of the acknowledged exploratory and hypothetical nature of this paper, and further investigation and exploration of the plan is surely necessary.

However the need for further investigation does not undermine the fundamentally strong synergies presented by the recycling plan. Of particular importance is that a recycling center does not vainly harken for a long-lost Motown, nor, however, does it reject that some of the strengths that built Detroit can be reclaimed. It recognizes the harm that the flight of jobs and capital to the suburbs has had. It also recognizes that the loss of blue-collar jobs, particularly from the automobile industry, has left the working-class in the central city in a precarious place. However, approached from a different angle this can be seen as a boon for the plan. If built more proximally to the central city—where there are plenty of vacant lots and old buildings and factories that could potentially be reclaimed and used—there are many idle but trained industrial employees who would be well-suited to manning recycling factories. The labor-intensive nature of recycling facilities, particularly those that require sorting, means that a large regional recycling facility could generate hundreds if not thousands of jobs. And while the political inheritance of Detroit is surely a hindrance to the broad cooperation that would be needed to implement a plan like this, the promise of good blue-collar jobs is surely a powerful argument in any debate.

The recycling center would also allow the city to upgrade its recycling infrastructure while finding cost-saving synergies with the infrastructure created to process waste from other municipalities. This means that there would be further impetus for Detroiters to embrace the plan, as well as for decision-makers at the regional level to do the same. The current system of

municipality-by-municipality waste management and processing is inefficient and precludes the possibility that the realization of greater scale could drive innovations and increased efficiency in the recycling and waste management industry. This plan provides a means by which this scale could be achieved.

As explored earlier, the current waste management system needs to change. The number of landfills is shrinking, and growing recognition of their harm means that new ones are unlikely to come online at a great enough rate to replace them. Additionally, developed countries have shown an inability to decrease total amounts of waste produced, which means that while source-reduction is clearly the preferred option, increased recycling capacity must also be created. Finally, New York and other East Coast cities are already shipping long distances and paying exorbitant amounts for their waste processing, which means that any proposal does not have to be cost—or carbon—neutral, instead it has to be better than the business-as-usual approach. In this light, a regional center in Detroit would also find synergies with these broader trends, and could prove a highly positive disruptive force in the waste industry.

Everyone from think tanks (the Brookings Institution) to government steering committees (the Detroit Works Project) to veteran business reporters (Gallagher) are calling for a reorientation towards a broadly sustainable Detroit. What you do with materials after they are no longer useful to you is a fundamental aspect of sustainability and it should not be ignored in these proposals.

In a 2009 article in *Time*, Daniel Okrent, awed by hydrogen fuel cell technology being developed in Detroit, wrote:

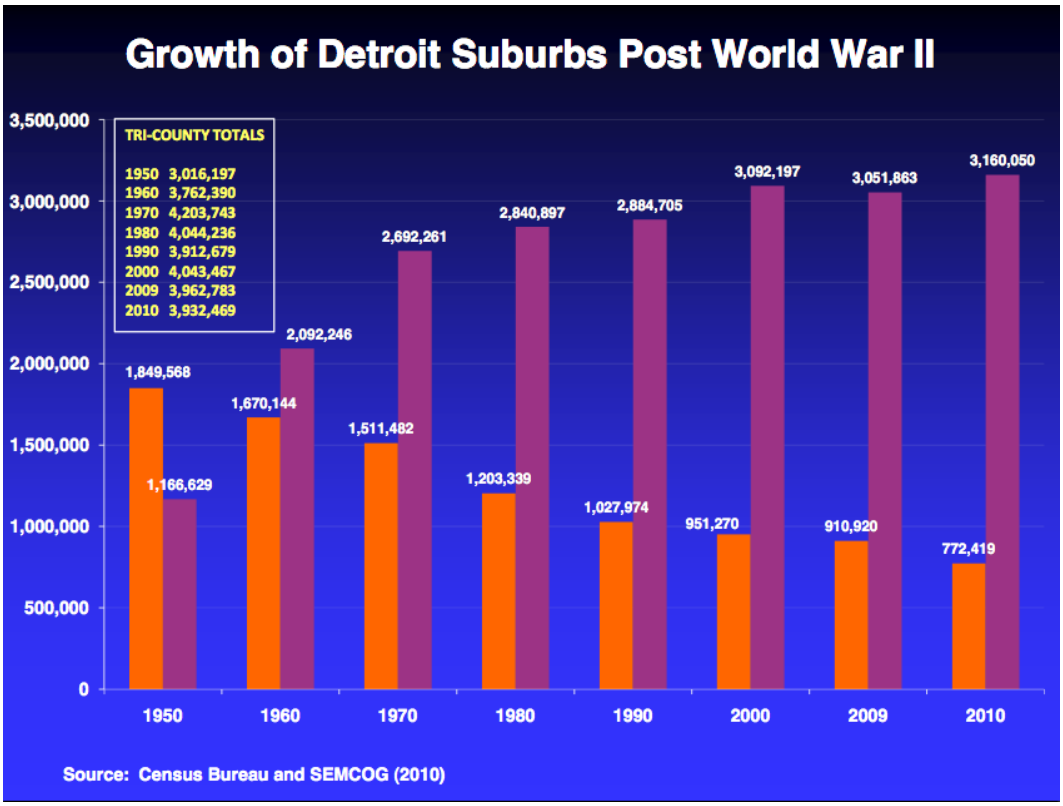
> What's to stop us now from turning Detroit — its highly trained engineering talent, its skilled and unskilled workforce desperate for employment, its underutilized production facilities — into the Arsenal of the Renewable Energy Future? If we did, Detroit could go back to building something America needs. As a nation, we could prove that we can

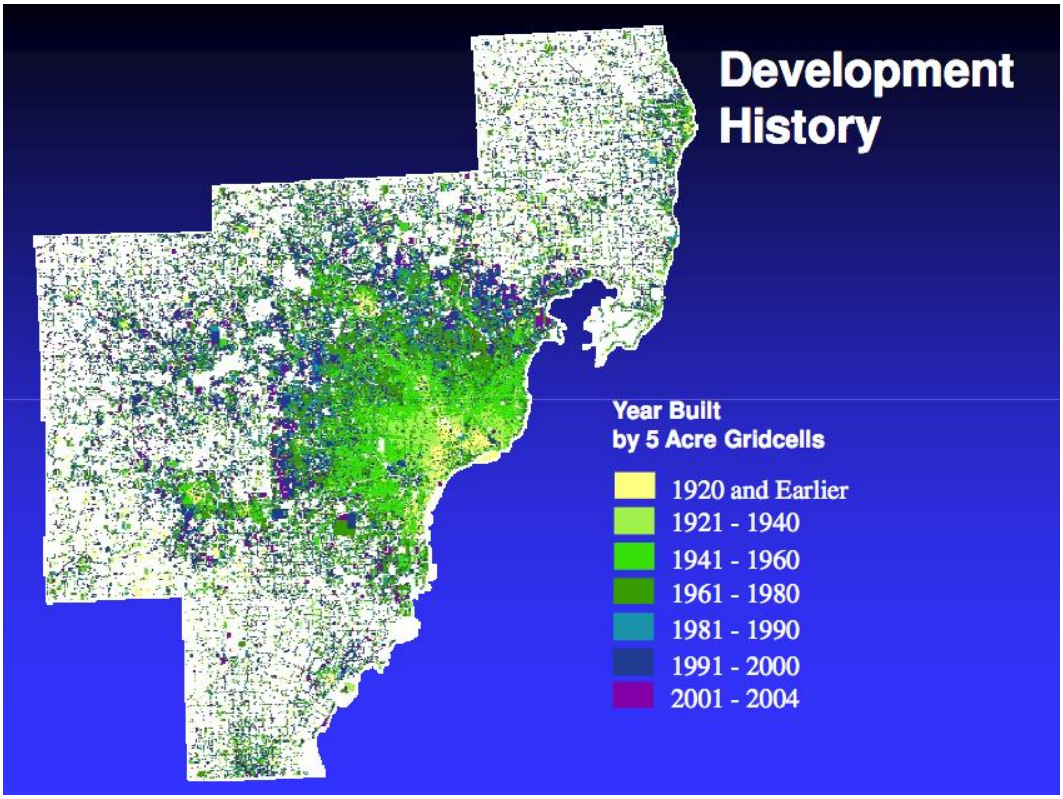
> still make things. And while we're at it, we could regenerate not just a city but our sense of who we are. (4)

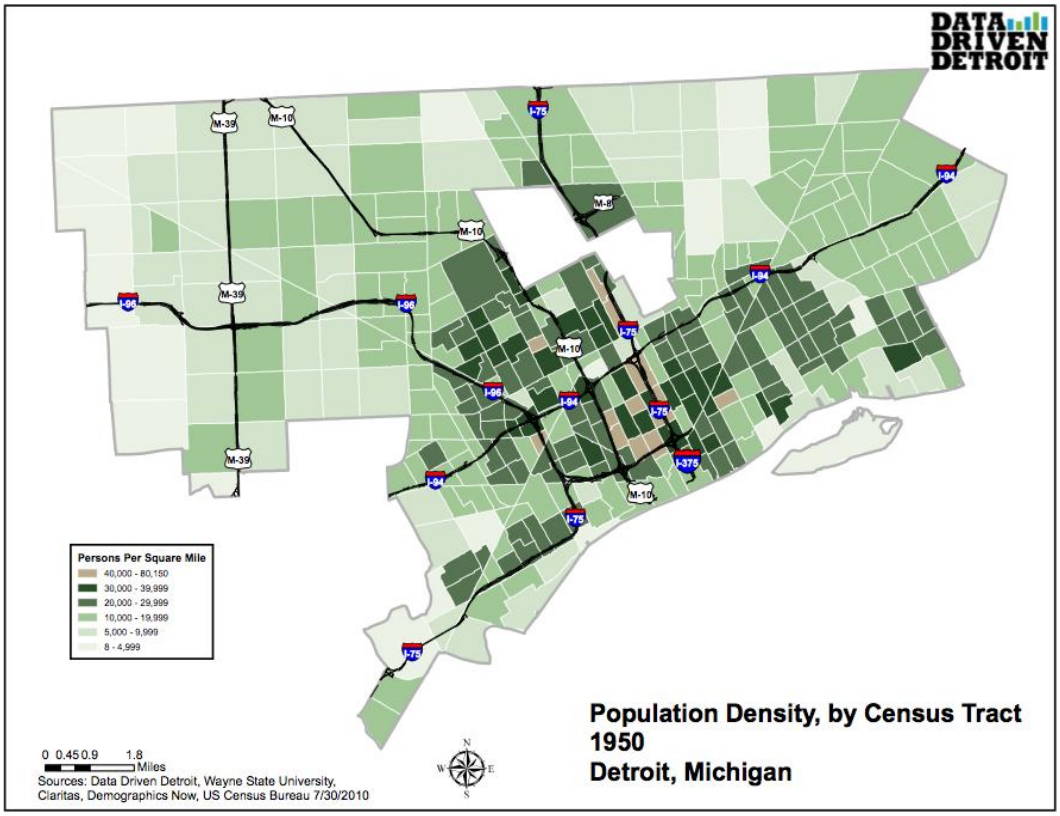
The idea of a fuel-cell revolution is amusing given the recent travails of that technology, but the importance of helping Detroit to achieve a brighter future is anything but. In this paper I have attempted to make the argument for further engagement with Detroit, to argue that it is not just necessary from a pragmatic economic standpoint, but equally from a moral one. There are many ideas of what this engagement should look like, of how the Arsenal of Democracy can best rearm. Along with the “green economy”, the “blue economy”, the “fuel-cell economy” and all of the other proposals I would like to throw the "brown economy" into the ring; imagine the reclamation and reinvention of one of our great cities through the reclamation and reinvention of the trappings of our daily lives. Don’t let the less-than-appealing sobriquet fool you, a regional recycling center in the Motor City just might have wheels.

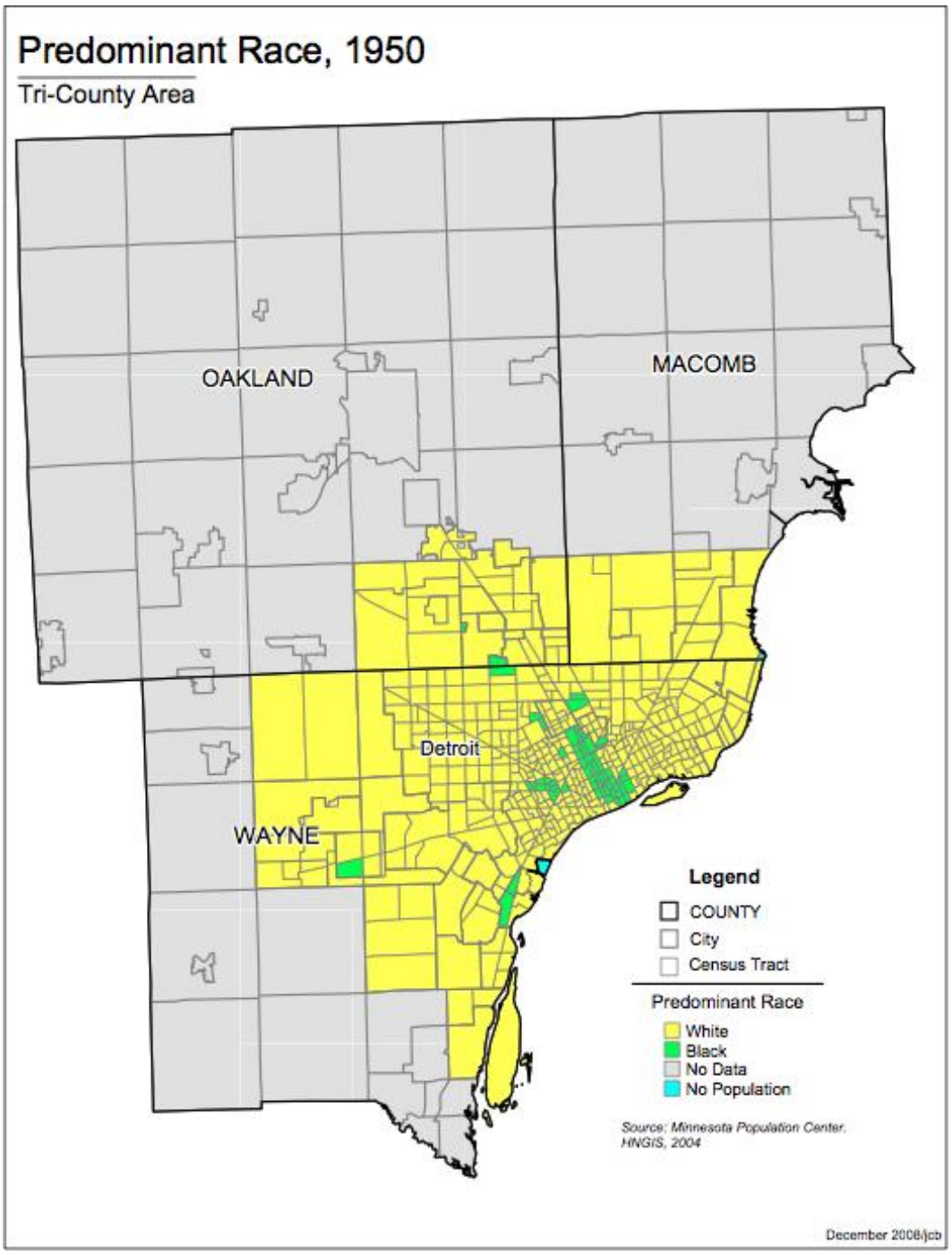
Appendix A

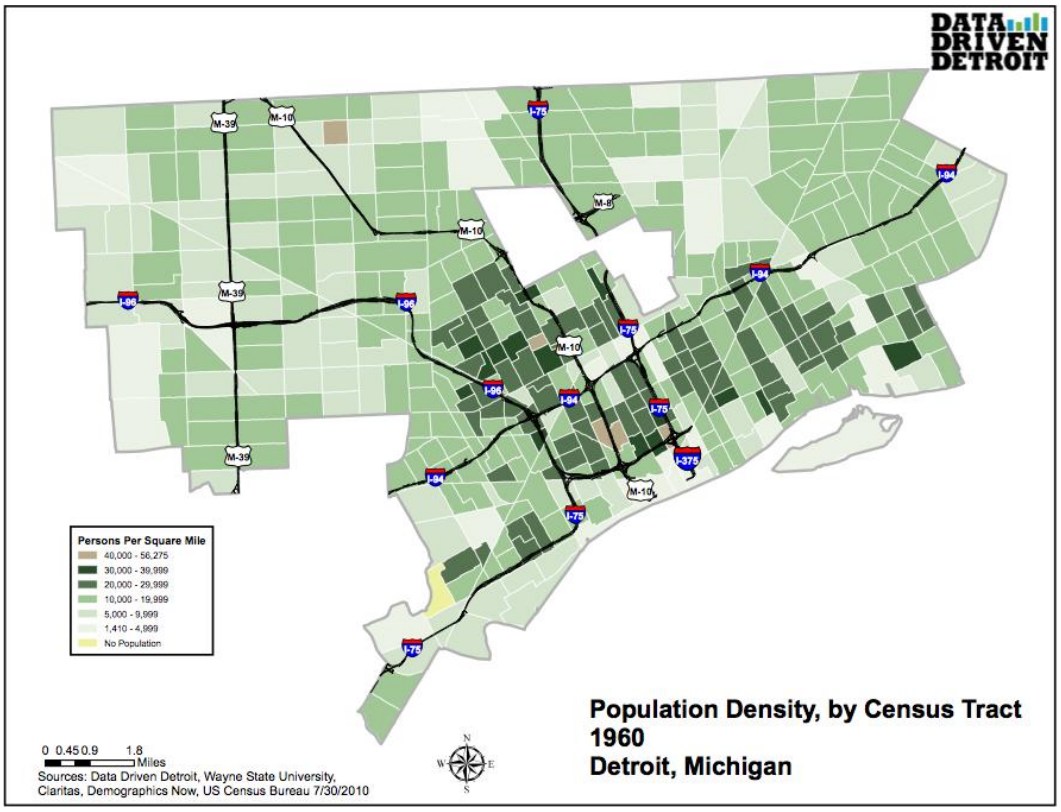
All graphs courtesy of Metzger (2010).

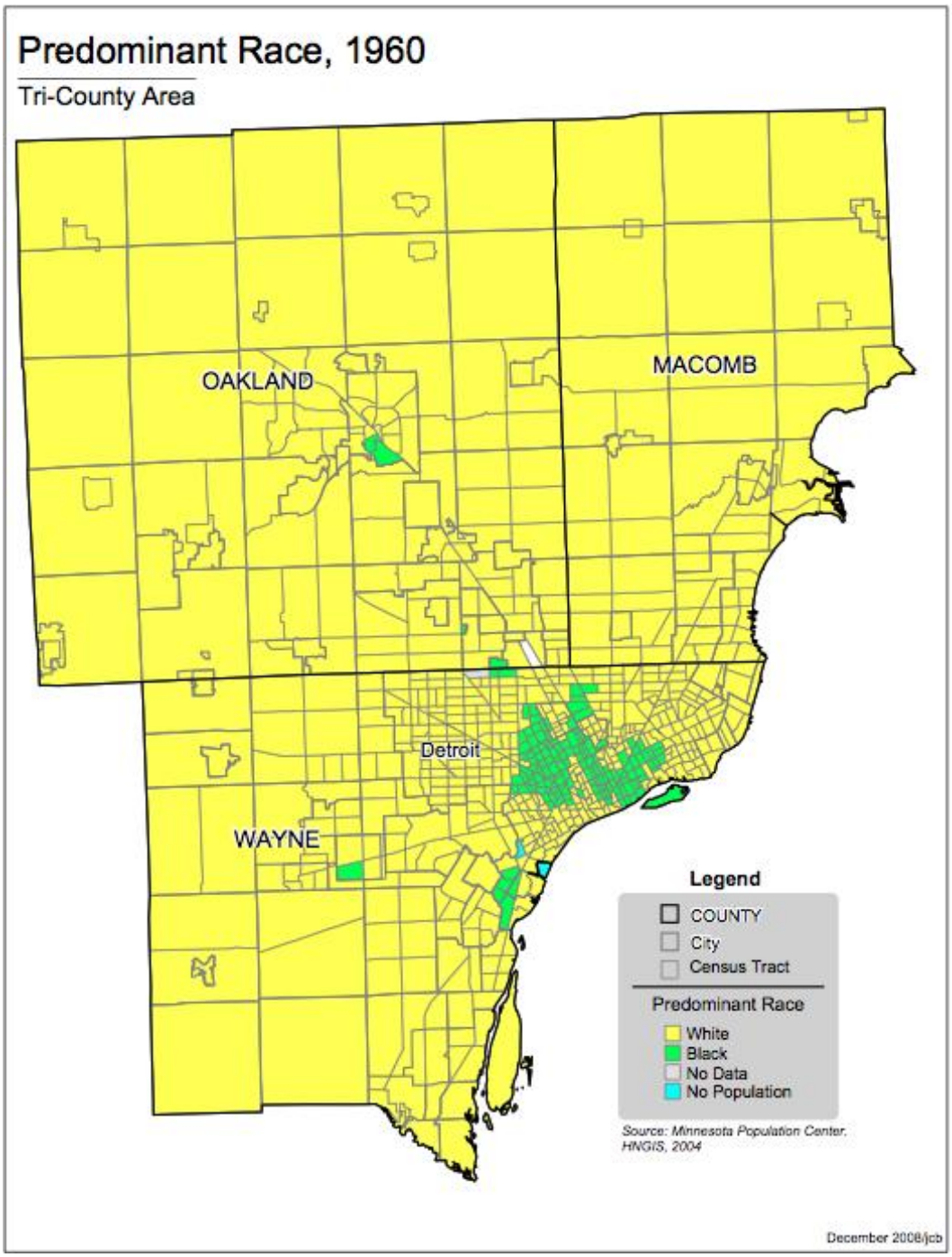


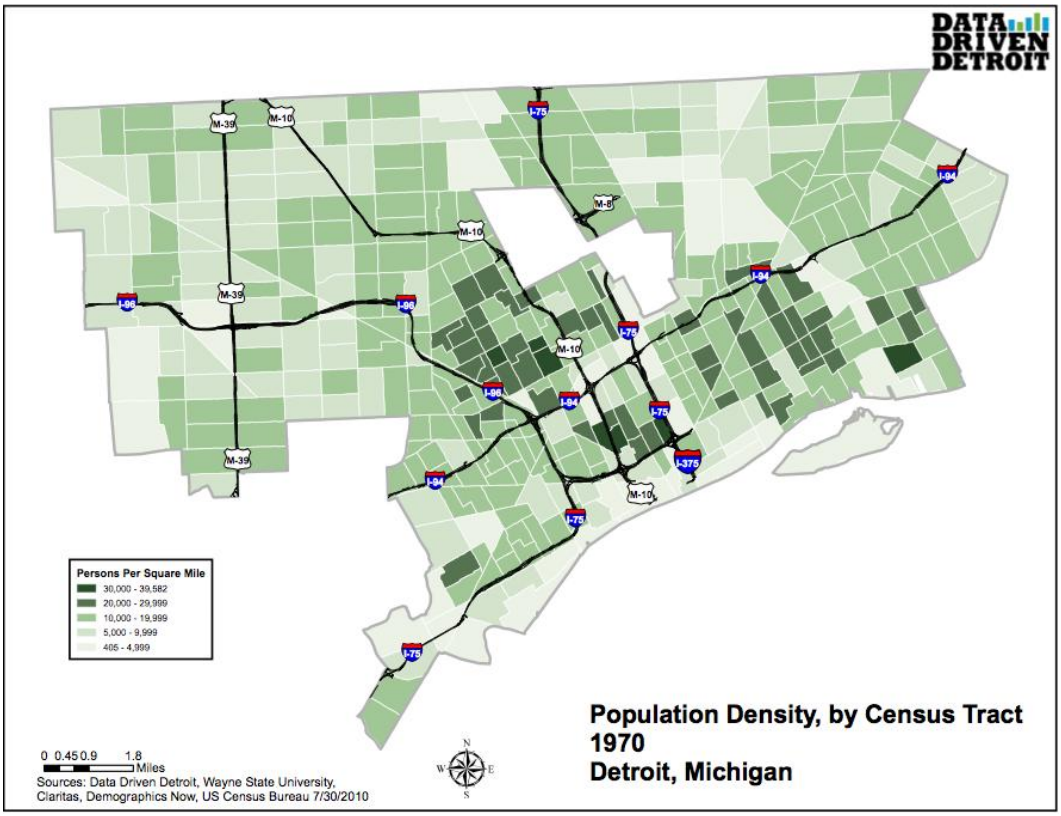

Development History
Year Built
by 5 Acre Gridcells
1920 and Earlier
1921 - 1940
1941 - 1960
1961 - 1980
1981 - 1990
1991 - 2000
2001 - 2004

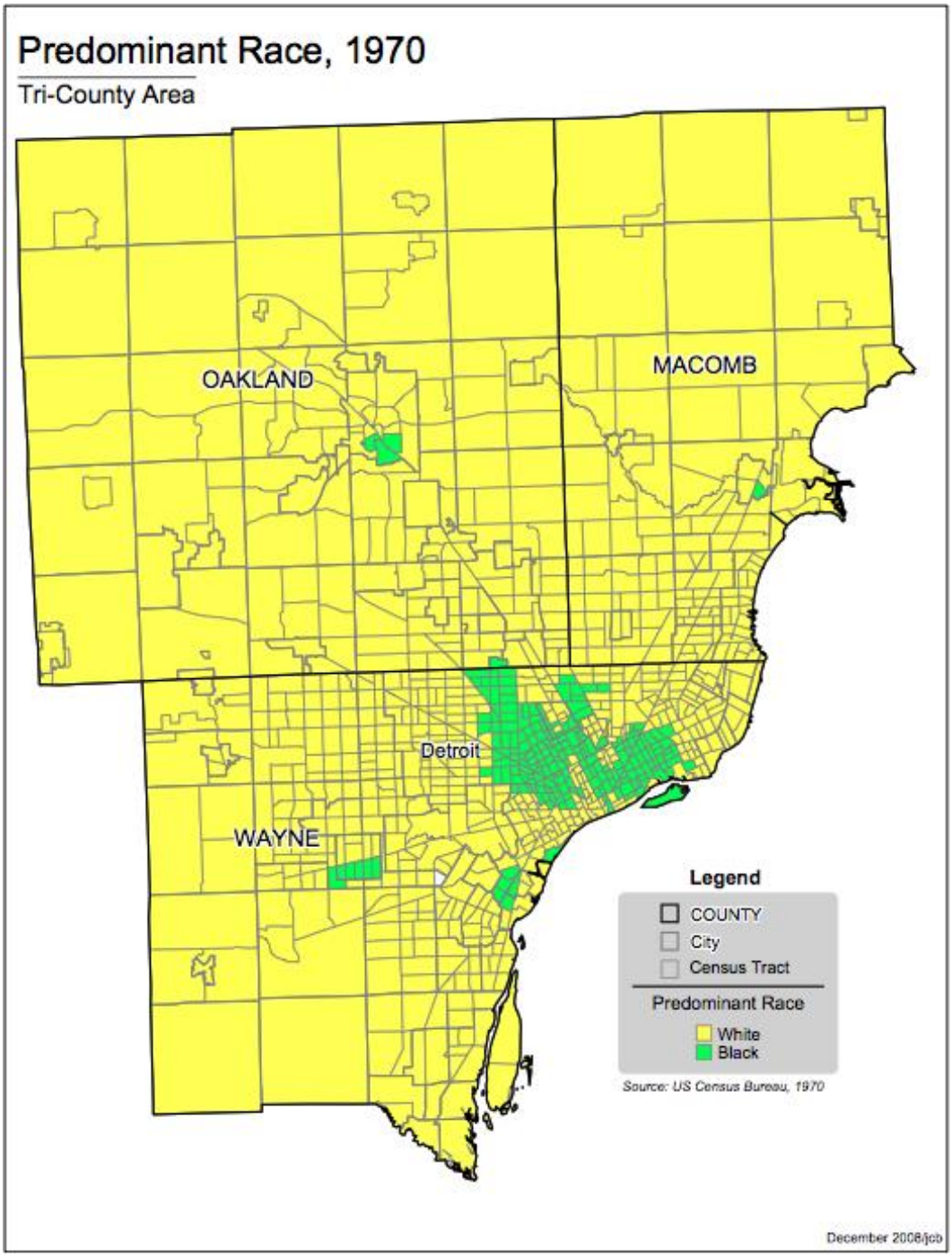

DATA DRIVEN DETROIT
Persons Per Square Mile
40,000 - 80,150
30,000 - 39,999
20,000 - 29,999
10,000 - 19,999
5,000 - 9,999
0 - 4,999
0 0.45 0.9 1.8
Miles
Sources: Data Driven Detroit, Wayne State University, Claritas, Demographics Now, US Census Bureau 7/30/2010
Population Density, by Census Tract
1950
Detroit, Michigan

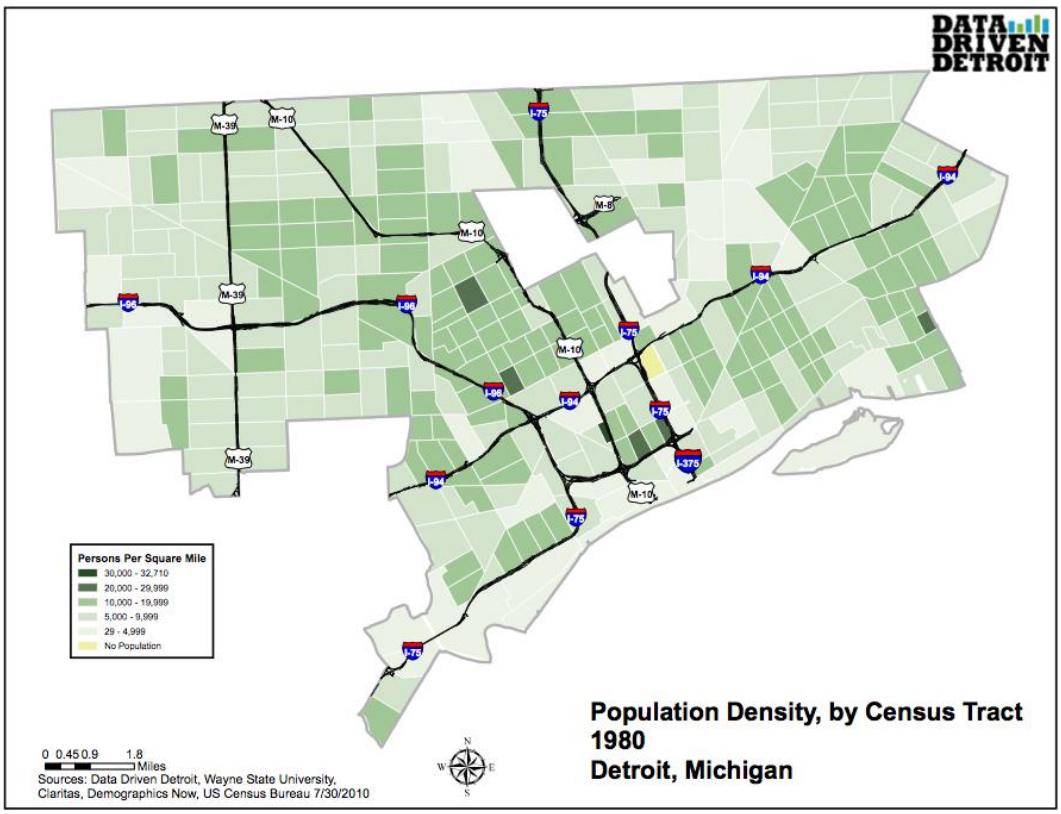

Predominant Race, 1950
Tri-County Area
OAKLAND
MACOMB
Detroit
WAYNE
Legend
COUNTY
City
Census Tract
Predominant Race
White
Black
No Data
No Population
Source: Minnesota Population Center. HNGIS, 2004
December 2008/jcb

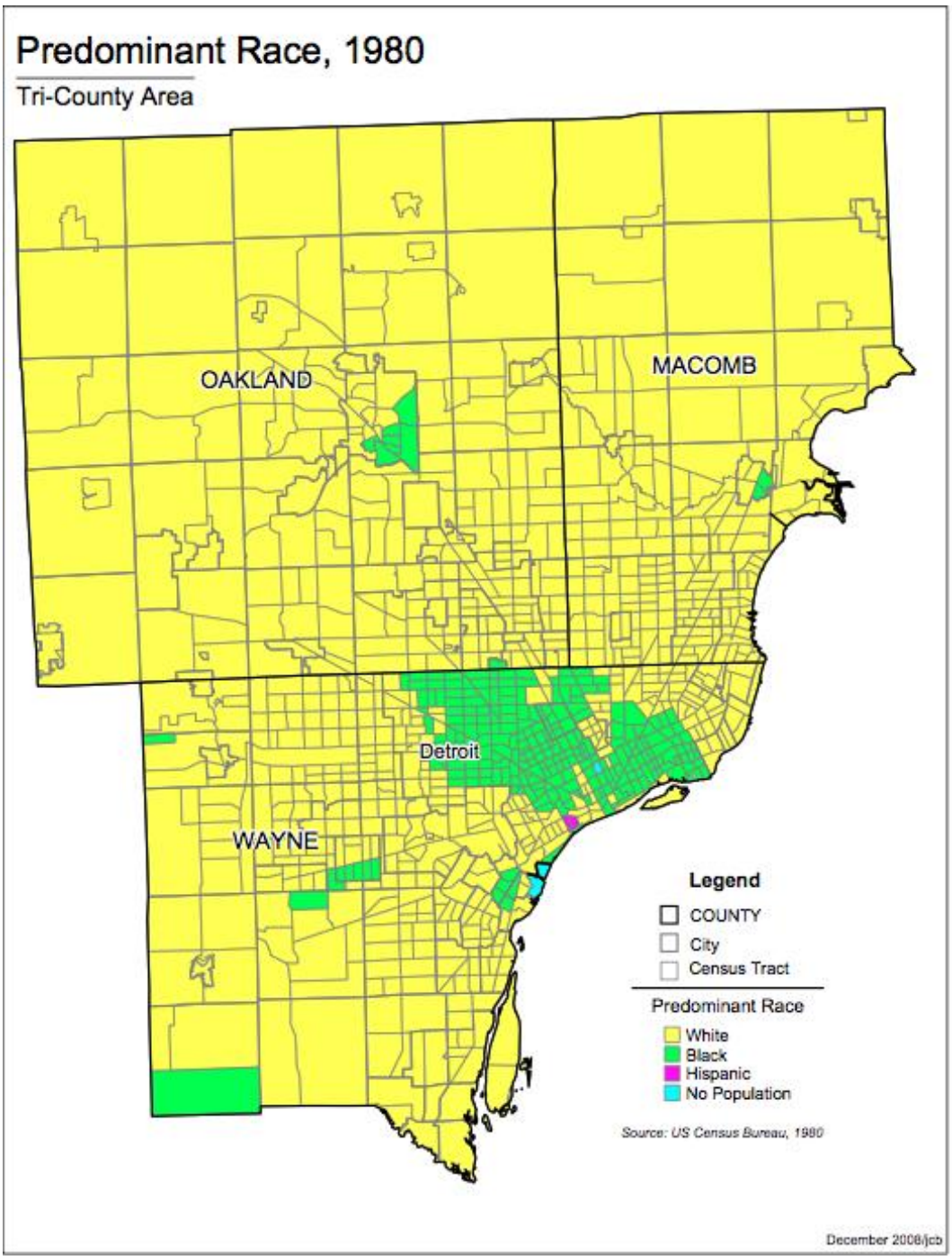

DATA DRIVEN DETROIT
Persons Per Square Mile
40,000 - 56,275
30,000 - 39,999
20,000 - 29,999
10,000 - 19,999
5,000 - 9,999
1,410 - 4,999
No Population
0 0.45 0.9 1.8
Miles
Sources: Data Driven Detroit, Wayne State University, Claritas, Demographics Now, US Census Bureau 7/30/2010
Population Density, by Census Tract
1960
Detroit, Michigan

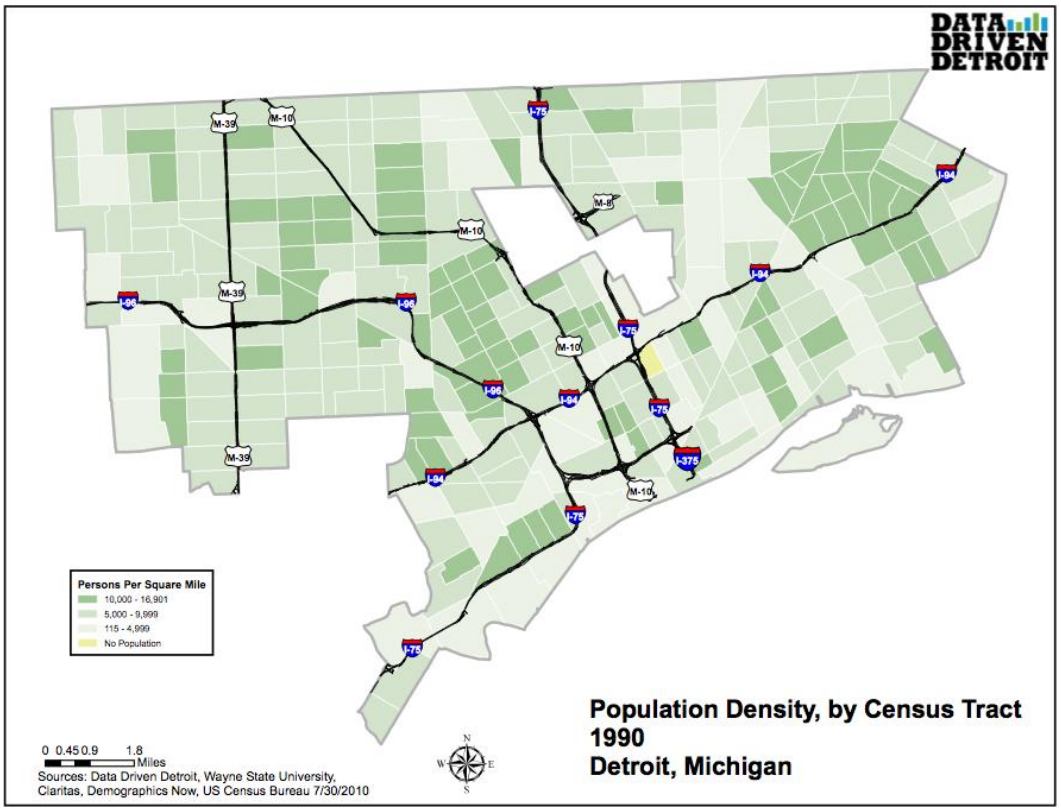

Predominant Race, 1960
Tri-County Area
OAKLAND
MACOMB
Detroit
WAYNE
Legend
COUNTY
City
Census Tract
Predominant Race
White
Black
No Data
No Population
Source: Minnesota Population Center. HNGIS, 2004
December 2008/jcb

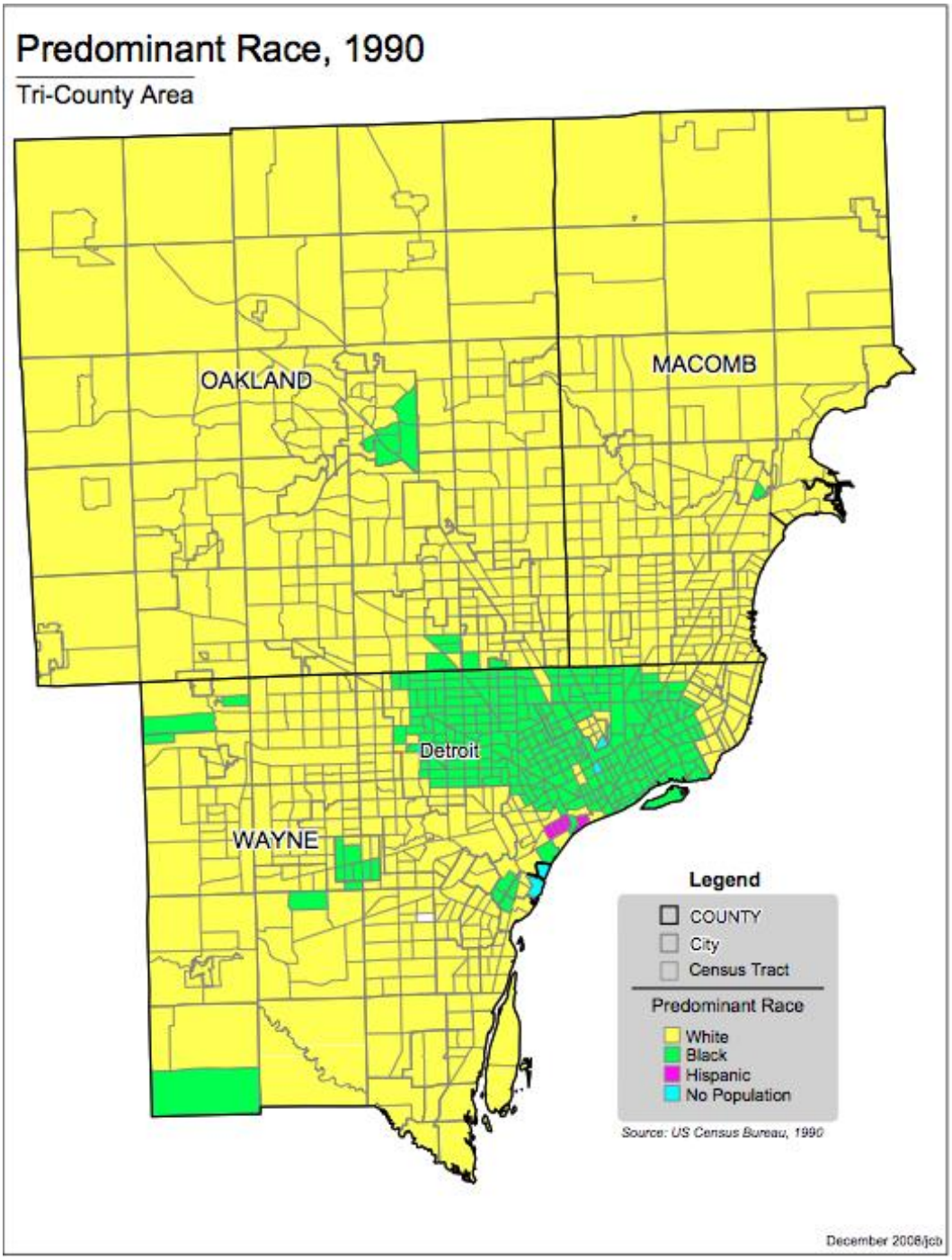

DATA DRIVEN DETROIT
Persons Per Square Mile
30,000 - 39,582
20,000 - 29,999
10,000 - 19,999
5,000 - 9,999
405 - 4,999
0 0.45 0.9 1.8
Miles
Sources: Data Driven Detroit, Wayne State University, Claritas, Demographics Now, US Census Bureau 7/30/2010
Population Density, by Census Tract
1970
Detroit, Michigan

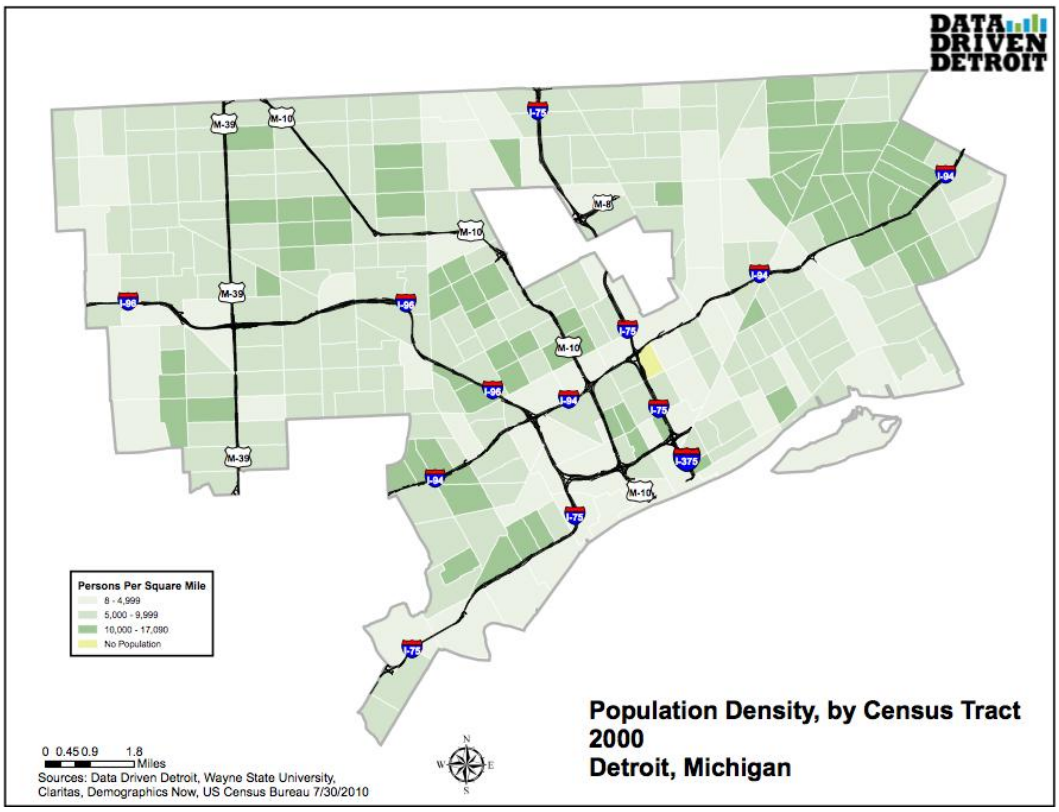

Predominant Race, 1970
Tri-County Area
OAKLAND
MACOMB
Detroit
WAYNE
Legend
COUNTY
City
Census Tract
Predominant Race
White
Black
Source: US Census Bureau, 1970
December 2006/jcb

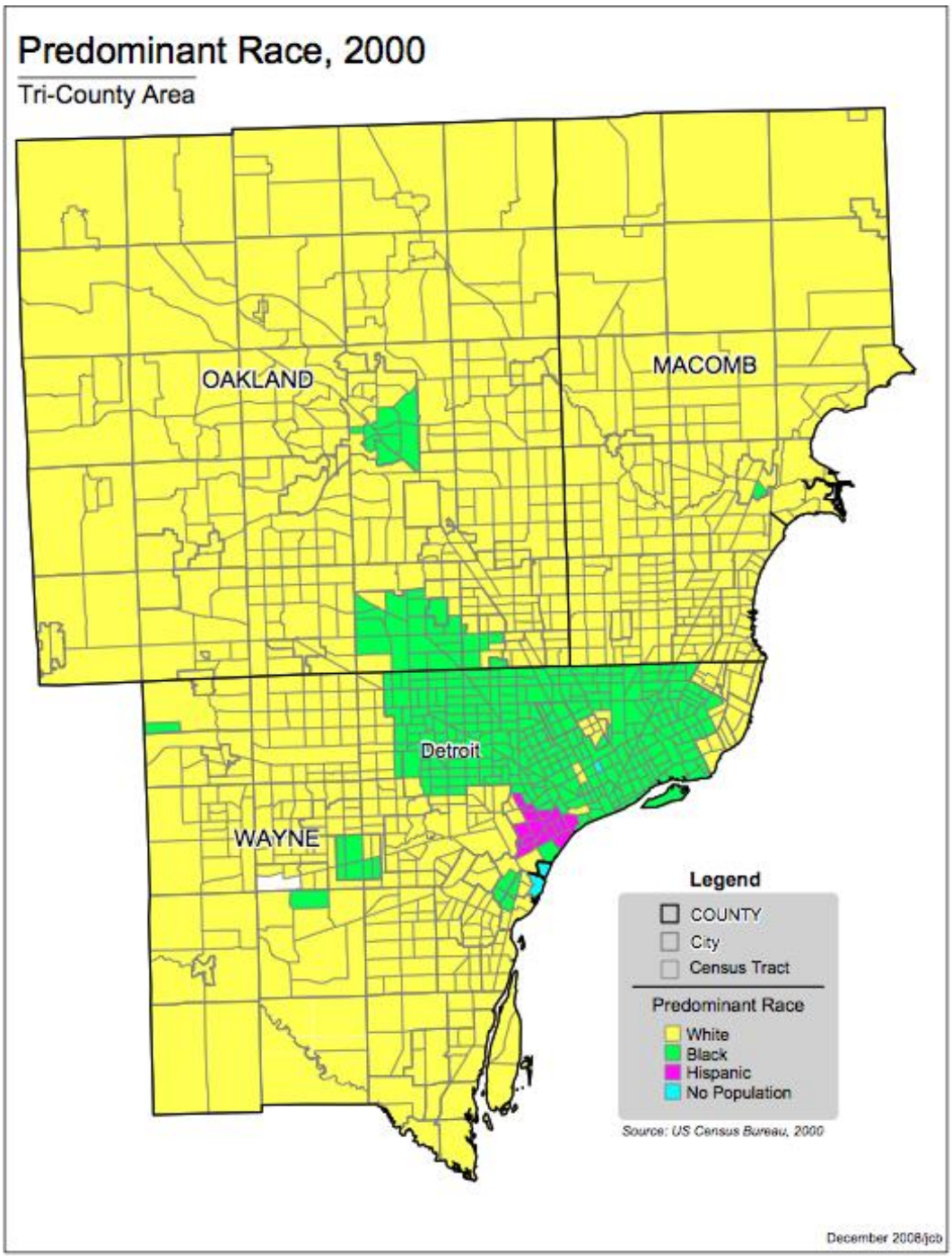

DATA DRIVEN DETROIT
Persons Per Square Mile
30,000 - 32,710
20,000 - 29,999
10,000 - 19,999
5,000 - 9,999
29 - 4,999
No Population
0 0.45 0.9 1.8
Miles
Sources: Data Driven Detroit, Wayne State University, Claritas, Demographics Now, US Census Bureau 7/30/2010
Population Density, by Census Tract
1980
Detroit, Michigan

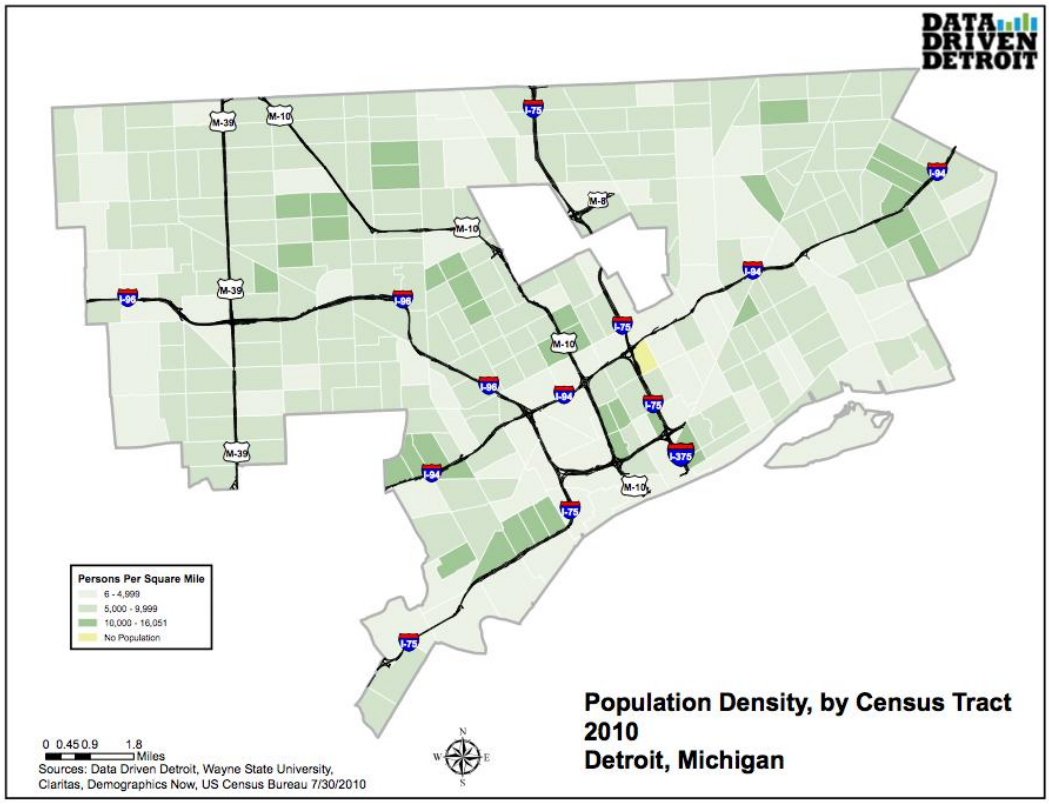

Predominant Race, 1980
Tri-County Area
OAKLAND
MACOMB
Detroit
WAYNE
Legend
COUNTY
City
Census Tract
Predominant Race
White
Black
Hispanic
No Population
Source: US Census Bureau, 1980
December 2008/jcb

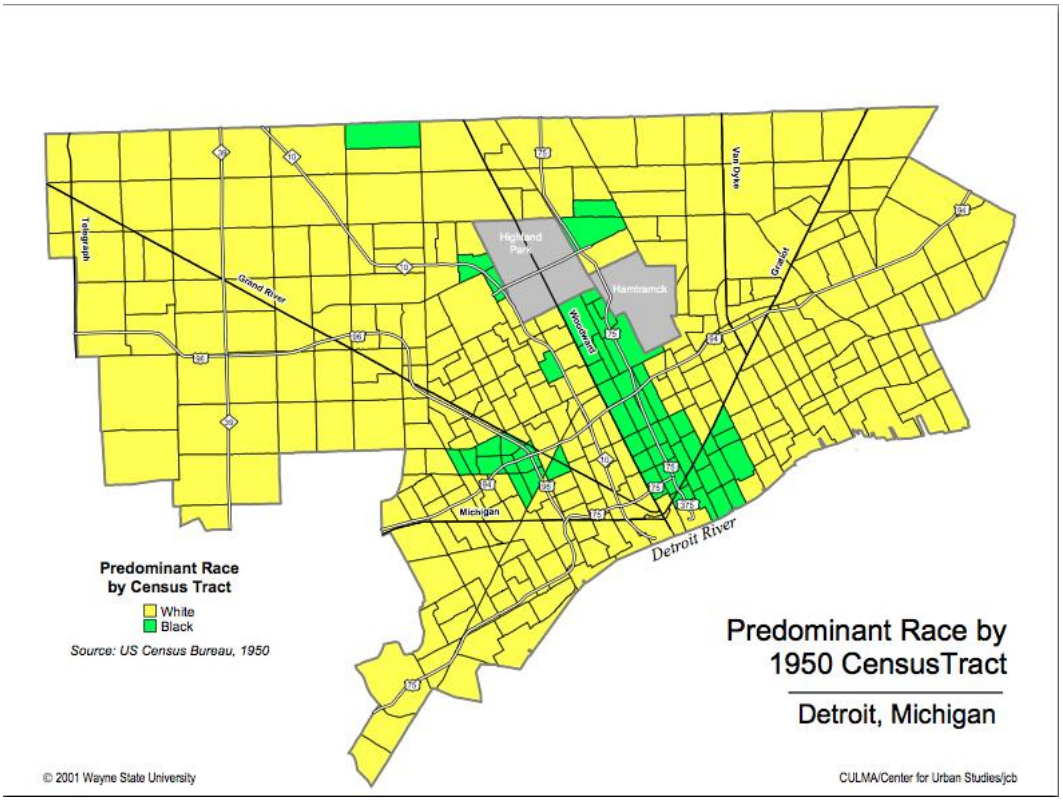

DATA DRIVEN DETROIT
M-39
M-10
I-75
M-8
I-94
I-96
I-375
Persons Per Square Mile
10,000 - 16,901
5,000 - 9,999
115 - 4,999
No Population
0 0.45 0.9 1.8
Miles
Sources: Data Driven Detroit, Wayne State University, Claritas, Demographics Now, US Census Bureau 7/30/2010
N
W
E
S
Population Density, by Census Tract
1990
Detroit, Michigan

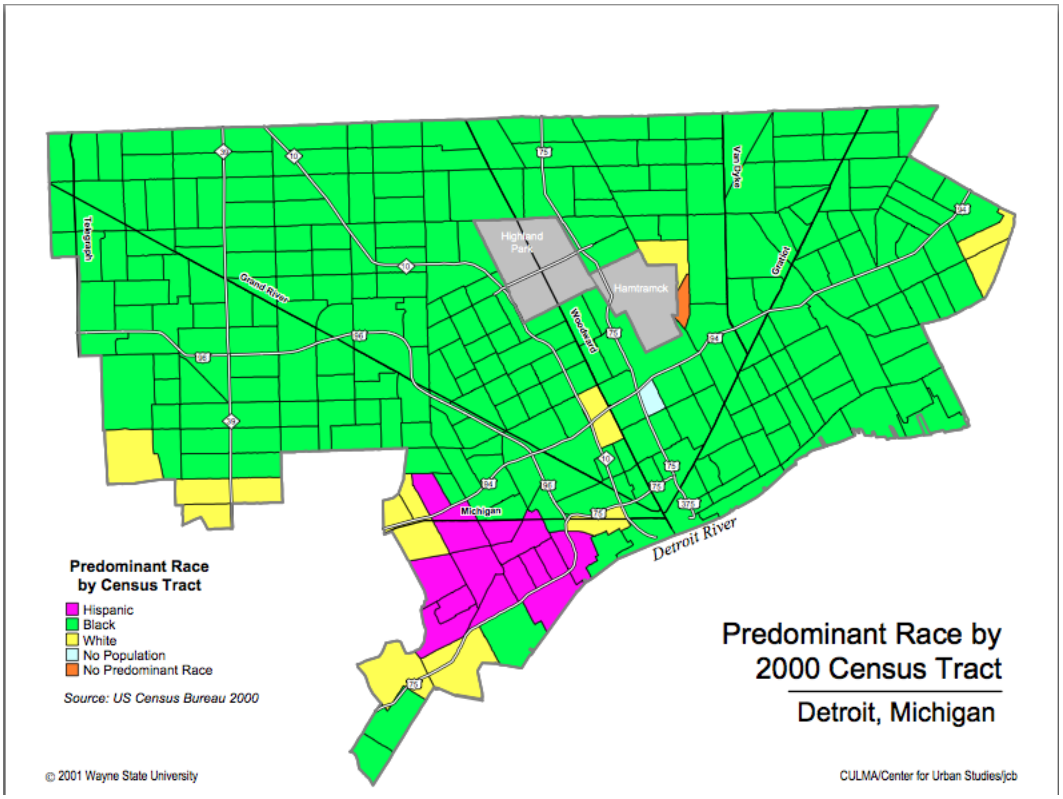

Predominant Race, 1990
Tri-County Area
OAKLAND
MACOMB
Detroit
WAYNE
Legend
COUNTY
City
Census Tract
Predominant Race
White
Black
Hispanic
No Population
Source: US Census Bureau, 1990
December 2008/jcb

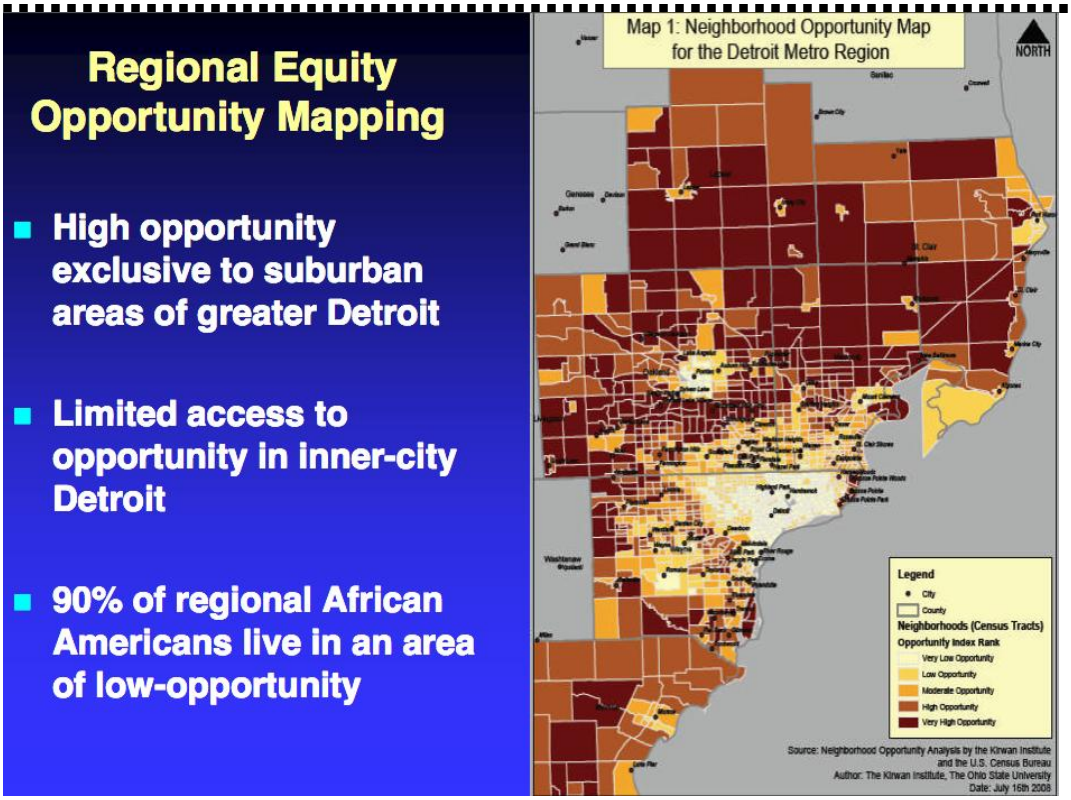

DATA DRIVEN DETROIT
Persons Per Square Mile
8 - 4,999
5,000 - 9,999
10,000 - 17,090
No Population
0 0.45 0.9 1.8
Miles
Sources: Data Driven Detroit, Wayne State University, Claritas, Demographics Now, US Census Bureau 7/30/2010
Population Density, by Census Tract
2000
Detroit, Michigan


Predominant Race, 2000
Tri-County Area
OAKLAND
MACOMB
Detroit
WAYNE
Legend
COUNTY
City
Census Tract
Predominant Race
White
Black
Hispanic
No Population
Source: US Census Bureau, 2000
December 2006/jcb


DATA DRIVEN DETROIT
Persons Per Square Mile
6 - 4,999
5,000 - 9,999
10,000 - 16,051
No Population
0 0.45 0.9 1.8
Miles
Sources: Data Driven Detroit, Wayne State University, Claritas, Demographics Now, US Census Bureau 7/30/2010
Population Density, by Census Tract
2010
Detroit, Michigan

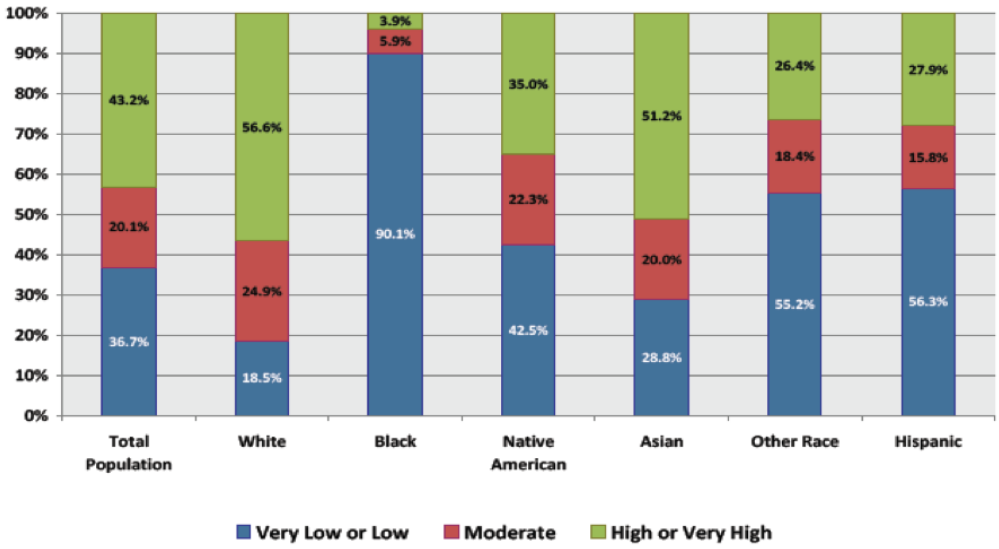

Predominant Race by Census Tract
White
Black
Source: US Census Bureau, 1950
Highland Park
Hamtramck
Grand River
Woodward
Van Dyke
Gratiot
Telegraph
Michigan
Detroit River
Predominant Race by 1950 CensusTract
Detroit, Michigan
© 2001 Wayne State University
CULMA/Center for Urban Studies/jcb


Predominant Race by Census Tract
Hispanic
Black
White
No Population
No Predominant Race
Source: US Census Bureau 2000
Predominant Race by 2000 Census Tract
Detroit, Michigan
© 2001 Wayne State University
CULMA/Center for Urban Studies/jcb
Detroit River
Highland Park
Hamtramck
Grand River
Michigan


Regional Equity Opportunity Mapping
High opportunity exclusive to suburban areas of greater Detroit
Limited access to opportunity in inner-city Detroit
90% of regional African Americans live in an area of low-opportunity
Map 1: Neighborhood Opportunity Map for the Detroit Metro Region
NORTH
Legend
City
County
Neighborhoods (Census Tracts)
Opportunity Index Rank
Very Low Opportunity
Low Opportunity
Moderate Opportunity
High Opportunity
Very High Opportunity
Source: Neighborhood Opportunity Analysis by the Kirwan Institute and the U.S. Census Bureau
Author: The Kirwan Institute, The Ohio State University
Date: July 16th 2008

Racial Disparity and Opportunity

Distribution of Racial Populations (% of Total Race Population) by Neighborhood Opportunity Type in the Detroit Metro Region



Income*

2000, 2009

	2000*	2009	Change	%Change
Median Household Income				
City of Detroit	38,089	26,098	-11,991	-31.3%
Southeast Michigan	63,303	48,535	-14,768	-23.3%
Macomb County	67,070	50,553	-16,517	-24.6%
Oakland County	79,692	62,308	-17,384	-21.8%
Wayne County	52,491	38,192	-14,299	-27.2%
Michigan	57,499	45,255	-12,244	-21.3%
United States	54,058	50,221	-3,837	-7.1%

* Note: All 2000 monetary values are adjusted to 2009 dollars using U.S. Consumer Price Research Series Index for All Urban Consumers (CPI-U-RS) from 1999 to 2009.
Source: U.S. Department of Labor

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