THE CITY SYSTEMS ELEMENT

THE SUSTAINABLE CITY

DETROIT FUTURE CITY

A Day in the Life

Improving City Services

"You work for Public Lighting? Let me ask you something…"

Demarco used to dread this moment at social gatherings. But in the last year or so, he has had many more answers for the questions that come his way. Instead of trying to provide exactly the same services to the entire city, his department has joined other city departments in a more strategic approach. Public Lighting now bases its upgrades and service decisions on real conditions and needs in each neighborhood. Maintenance schedules have been adjusted, too. As lighting strategies have improved this past year, so has public safety.

This strategy is also working for Demarco on a personal level. His neighborhood, which has had a lot of vacancy and safety problems because many lights had stopped working, is getting new installation of high-efficiency streetlights and is beginning to see a quicker response to other service requests, as well as a significant drop in car break-ins at night. The investment for physical infrastructure is coordinated with other investments in the city, too. For example, renovation of the local elementary school was timed with street improvements and tree plantings. The persistent flooding in Demarco's neighborhood is also being addressed, through a system of attractive marsh-like "swales" beside the streets that collect stormwater runoff from Demarco's neighborhood and connect to a broader system of boulevards with long, linear stormwater gardens and new tree plantings. An unexpected benefit of this change? Aquatic birds and other small native wildlife have found a refuge in parts of the neighborhood. Now if only Demarco can solve his trash pick-up problem: getting his sons to remember the trash schedule as well as the city does.

TRANSFORMATIVE IDEAS

CITY SYSTEMS AND THE ENVIRONMENT

RENEWING AND REALIGNING FOR THE NEW DETROIT. From streetlights and utility networks to waste management and transportation, Detroit's city systems sustain its residents and businesses—but in turn must be sustained by revenues from these users. Yet population and employment loss, and the resulting loss of revenue and disinvestment, have left Detroiters paying more for less.

Even though Detroit's economy is growing in new sectors—such as information technology, finance, communications, and design—the city will likely continue to lose some population over the next 20 years. Reorganizing the city's systems now is critical to meeting the needs of Detroiters who have been paying and waiting for a better day, as well to match and support the future Detroit of connected, diverse neighborhoods and employment centers that encourage new jobs and new neighbors. The city's government, private utility operators, civic and business leaders, and residents face big decisions about improving services while reducing costs, closing an overwhelming budget gap that has burdened the city for decades, and reshaping an over-scaled, underinvested infrastructure into an efficient, environmentally sustainable set of 21st century systems. **If we confront these tough decisions now, we can improve the quality of life for Detroiters and put the city back on the path to financial security within 10 years.**

RECONCILING AND REPLENISHING. Realigning Detroit's city systems is not just important for the sake of efficiency: It is a matter of justice for all. The most economically vulnerable households in Detroit are also the hardest hit by system inefficiencies that harm their health as well as their pocketbooks. In particular, air pollution from industry and car exhaust have contributed to high rates of asthma and other respiratory diseases, especially among children.

Transportation holds an important key to creating a socially and economically just Detroit. The Detroit of today is a driver's city, without enough transit or other transportation choices, and with many jobs well beyond the city limits. The very people who need jobs most are left behind, struggling with transit routes that don't connect them to work, or sharing an old car along with all the upkeep. Detroiters who can't afford a car are also cut off from fair access to healthy food, recreation, health care, and a whole range of necessities for a healthy, balanced life.

The urgency of addressing environmental degradation and residents' quality of life reaches far beyond city limits. Regional economies, transportation, and water and air quality issues connect Detroit to the entire Great Lakes ecosystem. Traditional infrastructures and industry tend to degrade resources, with regional consequences. **New alternative forms of infrastructure, using landscape to clean air and water, can restore environmental balance and improve quality of life and the environment in Detroit and in the entire Great Lakes basin.**

SHAPING THE CITY TO SUIT REAL NEEDS. The Detroit we now live in was designed for nearly 2 million people, and the extra capacity in city systems is not only going to waste, it actually creates a drag on services for the current residents. Just as we can find new ways to manage the abundance of land in the city, we can unlock innovations to manage surplus system capacity and reallocate resources to upgrade and maintain core systems, improve service, and heal the environment. Systems renewal will be coordinated with land use change to better relate neighborhoods and employment districts, as well as the systems that serve them.

The key is to be smart about how and where we locate and reinforce residential areas, employment, and other activities. These decisions must be balanced with the development Detroit has now, and especially with the knowledge that some residents will continue to live in areas that have high-vacancy. The Strategic Framework foresees how the city can evolve from its present pattern—which is spread out and hard to serve—toward a city of connected neighborhoods where employment, residences, and activities are all close by, or are connected in an efficient system of high-speed transit routes and green, landscaped boulevards. Some areas of the city that have already moved away from residential land use will be suited for new land uses and development types, including new green infrastructure that works

to clean the air and water and support the health of the whole city and region. Services will be scaled to the number of people and uses in each area of the city.

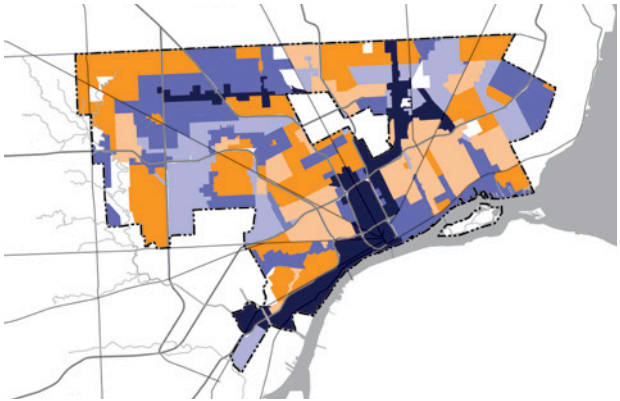
SYSTEM TRANSFORMATION. Three major transformations underpin the change in Detroit's systems—strategic renewal of infrastructure to suit demand, deploying surplus land as a form of infrastructure (radically changing the image of the city in the process), and changing the culture of transportation (to enhance connections and minimize environmental impact).

The goal of reconfiguring services is to continue to providing core services—including water, sewerage, gas, electricity, and communications services—to all Detroiters wherever they work and live, while also serving all the needs for existing and growing businesses. Delivering the change that has escaped the city in the past will require coordinated effort among all system providers, public and private. This coordination will need to be planned and carried out from a central point of accountability, in order to transform the city's infrastructure and service quality.

3 CITY SYSTEMS TRANSFORMATIVE IDEAS

1 STRATEGIC INFRASTRUCTURE RENEWAL

DIFFERENTIATED AND RELIABLE INVESTMENT. The Strategic Framework proposes a differentiated level of investment across the city, aligning infrastructure capacity to Detroit's future form and continuing to serve people where they live and work now. The potential benefits for economic development and cost reduction are significant, but cannot be achieved instantly. Instead, each area of the city will need an approach to investment that provides certainty and predictability so that systems agencies, businesses, civic groups, and residents can make long-term plans. Moving to a situation where more people live in higher-density areas and fewer people live in lower-density areas (a more efficient distribution) is a critical step in reducing the financial problems faced by service providers and end users.



SYSTEM DIFFERENCES AND INTEGRATION. The five key systems of water, waste, energy, transportation, and communications each have specific issues arising from their installation and ownership history, as well as their unique technical aspects. A proposed investment approach for each area of the city should be coordinated with land use and should prioritize how systems are upgraded or replaced over time. Although each system has its own peculiarities, coordinating the investments in related systems can provide significant efficiencies across all the systems.

2 LANDSCAPE AS 21ST CENTURY INFRASTRUCTURE

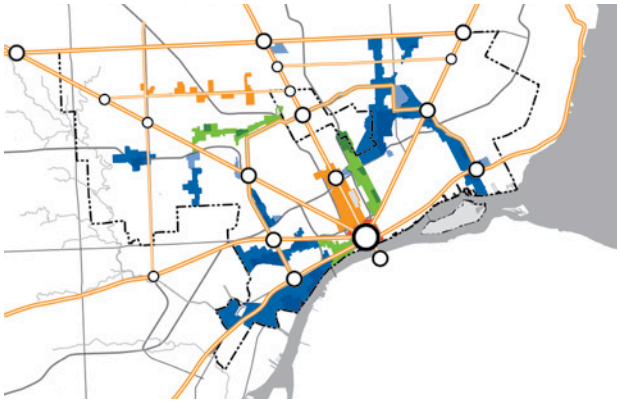
Landscape is an opportunity to address Detroit's critical environmental issues and public health hazards. In particular, blue and green infrastructures are landscapes that cleanse stormwater and improve air quality, respectively. Traditional infrastructural systems are typically focused on delivering only one service at a time, often at the expense of the environment and public health. By contrast, landscape infrastructures serve many functions by providing habitat, offering recreation opportunities, enhancing transportation options through bicycling and walking, and improving neighborhoods by providing beauty and increasing property values—all while serving a practical, environmental function such as retaining or cleansing stormwater.

Landscape systems typically cost less to build and maintain than conventional infrastructure, creating an economic benefit. Landscape infrastructures offer opportunities for interdisciplinary collaboration across agencies, permitting them share or coordinate personnel and budgets in ways that are not possible for conventional infrastructure projects. These systems will have regional ecological benefits, including improved water quality in the Rouge and Detroit Rivers and Lake Erie, as well as increased and improved habitat for local wildlife and migrating birds.

3 DIVERSIFIED TRANSPORTATION FOR DETROIT AND THE REGION

APPLYING NEW TECHNOLOGY TO EXISTING ROADS. The transportation system—especially Detroit's fixed road network—must be substantially reconfigured to suit the currently smaller population within the city, and will also have to adapt to suit emerging needs within the city and region. Because Detroit is also central to the support system for a freight hub of national and global significance—the busiest North American commercial border crossing, and a significant freight employer in its own right—the creation and upgrading of freight routes into and through Detroit need consistent, long-term support. At the same time, residents urgently need more transportation choices beyond driving.

New technologies can be integrated into Detroit's transportation network to serve both commercial and personal transportation. Mobile devices (including cell phones) can be used by users and operators to manage on-demand services that match capacity to demand, improving efficiency and allowing smaller fleets to serve the same number of people. Modest adjustments to the existing road



network will greatly facilitate the integration of new technology. The very size of Detroit's existing roads also offers an opportunity to make change with significantly less disruption than in a fast-growing city.

ADDRESSING THE DISTANCE AND DENSITY CHALLENGES. A key challenge in Detroit is how spread out the city is, compared with cities of similar population. The relatively low density and long distances between employment and neighborhoods, coupled with how many commute out from the

city every day, will challenge the city and region to devise strategies to increase transit access and use. Bringing more jobs within reach of public transit is only part of the answer. Overhauling the operational practices of the region's transit providers is the other part. Encouraging and supporting greater use of cycling and walking represents a low-cost way to support system-wide change in transportation with a relatively small investment. Key changes will be the development of a 'greenway' network to promote cycling and walking, introduction of bus rapid transit (BRT) operations on main travel routes (within and beyond the city limits), and improved intermodal transfer for passengers and freight.

REALITIES

REVENUE & STRUCTURE MISALIGNMENT

40%

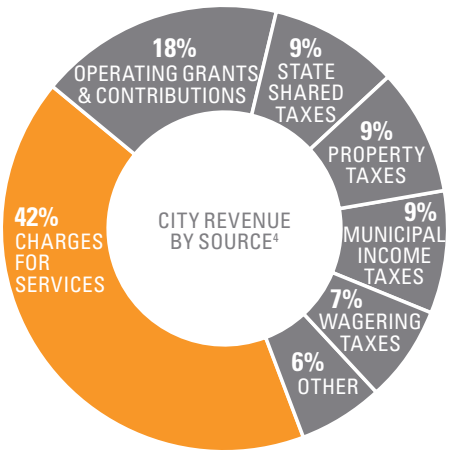
PUBLIC TRANSPORTATION IS RELIANT ON CITY'S GENERAL FUND TO SUBSIDIZE 40% OF REVENUES[1]

-$336M

DETROIT HAS EXPERIENCED A $336 MILLION DECLINE IN PROPERTY TAX REVENUE FROM 1950-2005 (60% DECLINE)[2]

20%

20% OF DETROIT'S POTENTIAL REVENUE GENERATING LAND AREA IS VACANT[3]



1) McKinsey 2010; 2) SEMCOG 2008; 3) Hamilton Anderson Associates, Happold Consulting, Inc. (HCI); 4) HCI

UNDERUTILIZED SYSTEMS

32%

In 2010, Detroit families spent an average of 32% of their annual household income on transportation[5]

27%

27% of Detroit's 3000 miles of public roads are in poor condition[6]

35K

WORKING LIGHTS

Only 35,000 of the existing 88,000 street lights work in Detroit[7]

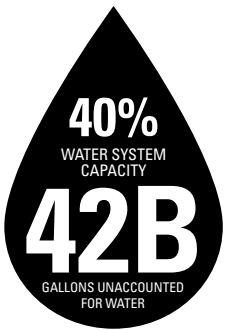
ONLY 9% OF DETROITERS USE PUBLIC TRANSIT[8]

BUSES RUN AT 75% CAPACITY DURING PEAK HOURS

Buses run at 75% capacity during peak hours in Detroit. The national average capacity for United States buses during peak time is 105%[9]

5) American Community 2010 5-Year, HCI; 6) SEMCOG; 7) The Detroit Free Press;
8) SEMCOG; 9) HCI

ENVIRONMENTAL IMPACT



ENVIRONMENTAL HEALTH HAZARDS

DETROIT'S WATER SYSTEM OPERATES AT 40% OF ITS OVERALL CAPACITY[10]

DETROIT'S 42 BILLION GALLONS OF WATER CLASSIFIED AS 'UNACCOUNTED FOR WATER' OFTEN RESULTS FROM LEAKS, METER INACCURACIES & HYDRANT USE[11]

47.7 BILLION GALLONS OF RAW, UNTREATED SEWAGE WERE DIRECTLY DISCHARGED INTO THE DETROIT RIVER IN 2011. THIS VOLUME IS EQUIVALENT TO 4,800 OLYMPIC-SIZED SWIMMING POOLS [11]

DTE HAS INCREASED ITS COAL CONSUMPTION BY 80% SINCE 1975[12]

DETROIT HAS THREE TIMES HIGHER RATE OF CHILDREN WITH ELEVATED BLOOD LEAD LEVELS THAN THE NATIONAL AVERAGE[13]

DETROIT HAS THREE TIMES HIGHER RATE OF CHILDREN WITH ASTHMA THAN THE NATIONAL AVERAGE[14]

10,11) Detroit Water and Sewerage Department (DWSD); 12) Michigan Department of Environmental Quality; 13) Michigan Department of Community Health; 14) Detroit Alliance for Asthma Awareness

THE STATE OF DETROIT'S CITY SYSTEMS

DETROITERS PAY TOO MUCH FOR TOO LITTLE. As some areas of Detroit have withstood an exodus of more than 80% of residents, those who remained bore the brunt of the cost for services. Yet the revenue from these households was not enough for the major renewal or replacement that would have brought systems in line with modern environmental and efficiency standards. Although the relationships between rates and numbers of residents is more complicated with regard to the private service providers, (because they may operate related services both within and outside of the city limits), for both public and private providers, the fixed costs for services are being spread over a progressively smaller number of residents and businesses. The rates charged for these services are tending to rise and, in some cases, are becoming too expensive for households to maintain. In short, rates for residents are rising, the costs to serve the city are also rising and yet, level and quality of service is tending to fall for most residents.

LEGACY SYSTEMS NO LONGER SERVE THE REAL DETROIT. The city's main systems were planned for larger city with a heavier load of industrial activity than Detroit has today. The legacy systems of Detroit are not right for the new city. The system's capacity far exceeds what is needed today: sometimes usage levels are as low as 30-40% of designed capacity). Not only are the systems mismatched to the restructured (and restructuring) city, they are also aging. Many have already reached the end of their effective design lives and many more will do so during the next twenty years. Aging systems malfunction more often, which when compounded by climate change can have severe economic and personal consequences (flooding is a particular example of this). In many cases the systems are operated and managed following models that are no longer appropriate to the current situation of the city. Personnel shortages and training deficiencies contribute further to these problems.

TRADITIONAL INFRASTRUCTURES ARE NOT SUSTAINABLE. Existing infrastructure systems are struggling in Detroit, placing increasing fiscal burdens on residents and continuing to impact the environment and human health adversely. With

aging systems, shrinking budgets, retiring staff, and a declining population, these problems will only grow over time. Addressing these problems cannot be done conventionally; there is a need to find new ways to address city needs. City residents need access to clean air, soil, and water for good health. Local wildlife and migrating birds need access to areas of suitable contiguous habitat.

Changing climatic conditions in the future may cause the problem to worsen, particularly with regard to the stormwater issue in Detroit. Climate change may bring changes in long-term precipitation patterns and an increased frequency and intensity of heavy rainfall events. Short term, very intense rainstorms pose the greatest challenge for Detroit's stormwater system. Detroit's soil conditions, which have very low permeability, lead to high runoff rates, and the Wastewater Treatment Plant cannot handle these sudden, severe spikes in runoff.

HEALTH HAZARDS. Detroiters have been harmed by dangerous conditions caused or contributed to by the city's inefficient systems. For example, Detroit has a combined wastewater/stormwater system, and when system flows exceed treatment capacity, untreated combined sewage/stormwater overflows into the Detroit and Rouge Rivers. Detroit's wastewater treatment plant is the largest in North America yet cannot handle the stormwater/wastewater flows brought to it during many heavy rain events. These discharges occur at a number of outfall locations along the Detroit and Rouge Rivers, and in 2011, the greatest volumes of diluted (untreated) discharge occurred near downtown.

Poor air quality along transportation and industrial corridors is responsible for significant human health problems. As a result Detroiters have among the highest rates of asthma and related respiratory diseases nationally. African Americans and the poor are disproportionately affected due to the legacy of racially charged policies that targeted these communities as receivers of new highways, incinerators and industrial activity.

THE BURDEN ON LOWER-INCOME RESIDENTS AND CHILDREN. Lower income, minority residents, and children are more frequently exposed to hazards and also more likely to get sick from this exposure. They are more likely to

- live or work near environmental hazards;
- have trouble getting health care and health information because of a wide variety of barriers, including lack of health insurance and problems with transportation; and

- experience difficulties affording and accessing foods to ensure a healthy diet.

Adverse health impacts disproportionately affect children, who are more at risk because their exposure potential is greater (greater likelihood to come into contact with contaminants), exposure can be disproportionately more harmful to their small bodies than to an adult's, and their maturing nervous systems are more susceptible to damage. Lead is a particularly harmful substance for children because exposure at a young age permanently affects their potential to succeed later in life. Lead exposure can impair brain development, impair growth, and cause children to be inattentive, hyperactive, irritable, and have problems with learning, reading, and memory.

THE CASE FOR LANDSCAPE. 20th century infrastructures such as highways often divided neighborhoods and degraded environments, but landscape is a new form of infrastructure for the 21st century city that brings people together and functions ecologically.

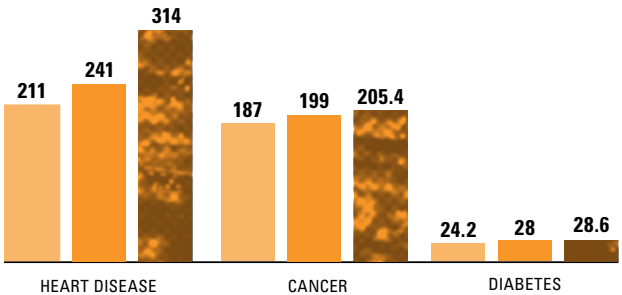
Landscapes can perform infrastructure functions less expensively than conventional systems. Landscape can be adapted to serve stormwater/wastewater, energy, roads/transportation, and waste infrastructure systems. Blue infrastructures are water-based landscapes like swales, retention ponds, and lakes that capture and clean stormwater, reducing the quantity and improving the quality of water that enters the combined stormwater/sewage system. Reducing water that enters the system will help reduce the frequency and quantity of illegal discharges into the Detroit and Rouge Rivers. Blue infrastructure provides an active use for vacant land and oversized roads. Converting portions of under-used roads to swales reduces road maintenance costs. Green infrastructures are forest landscapes that improve air quality by capturing air-borne pollutants from industry, vehicular exhaust along interstates, and infrastructure facilities like the Detroit Resource Recovery Facility, which incinerates household waste. Green infrastructure also includes greenways, paths and dedicated lanes for bicycling, walking, and running.

Landscape infrastructure can act as multiple kinds of infrastructure at once; blue and green corridors capture stormwater while working with multimodal transit strategies and plugging into employment centers and retail/commercial nodes. In doing so, landscape systems have benefits that carry far beyond the inherent function they serve. Landscape infrastructures provide a wide range of benefits:

- environmental benefits: clean air, improve water quality, capture stormwater, clean soil, provide habitat for local wildlife and migrating birds
- fiscal and economic benefits: reduce maintenance and utility costs, perform roles of traditional systems, create jobs, produce food and other tangible products; create an attractive, unique environment that can draw new businesses to Detroit
- social benefits: allow for recreation and promote other forms of social life; stabilize neighborhoods by acting as an amenity that helps to increase property values; improve resident health and comfort; provide new uses for and management of currently vacant land; remake the image of the city

Landscapes can address environmental justice issues by cleaning contaminated soil, improving air quality, buffering impacts of industry/infrastructure on residents, and reducing the cost of service (by reducing construction and operating costs). In short, landscape can help ensure that environmental burdens are not born disproportionately by Detroit's most vulnerable residents, especially people living on modest incomes or in poverty, and children. Landscapes create healthier neighborhoods for all Detroiters, and a new green image for the city.

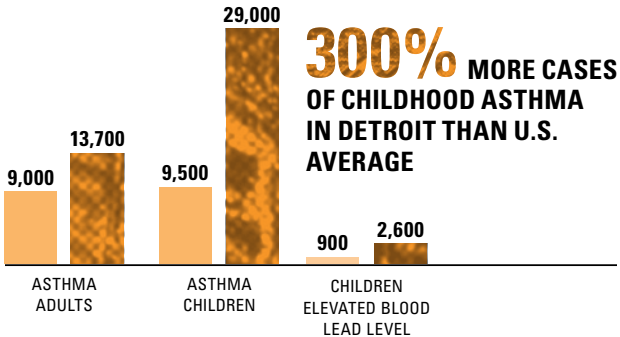
COMPARATIVE DEATH RATES PER 100,000 POPULATION



U.S.
MICHIGAN
DETROIT

Detroiters have a higher incidences of heart disease, cancer, diabetes, adult and childhood asthma, and elevated blood lead levels within children than the national average. Many health problems are correlated with general lifestyle factors including diet and exercise; others are associated with unfavorable environmental conditions.[1]

PREVALENCE RATES PER 100,000 POPULATION

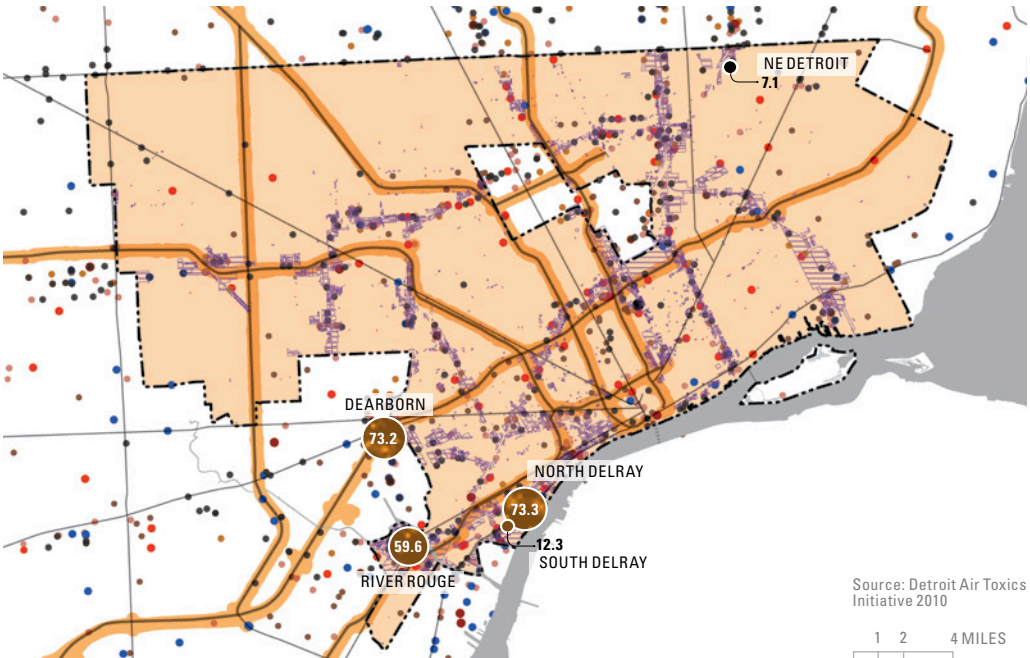


300% MORE CASES OF CHILDHOOD ASTHMA IN DETROIT THAN U.S. AVERAGE

Data Sources: 1) Michigan Residents Death File 2007, Division of Vital Records & Health Statistics, MIchigan Department of Community Health, Michigan State Occupational Illness Annual Blood Lead Levels 2009, Asthma Initiative of Michigan, Detroit Alliance for Asthma Awareness, Obesity Stats: Detroit Youth Behaviour Survey 2009, Michigan Department of Community Health 2009

TOTAL CANCER RISK AT MONITORING SITES

*** SIZE OF CIRCLE INDICATES RELATIVE RISK**



AIR QUALITY + HEALTH

TOTAL CANCER RISK AT MONITORING SITE

Health risks associated with poor air quality are higher in Southwest Detroit. Michigan Department of Environmental Quality conducted two studies to assess air quality and health risk in Detroit (DATI-1 and DATI-2). The map takes into account air quality measurements from 2006-2007, MDEQ DATI-2.

19.5%

19.5% OF DETROITERS HAVE NO HEALTH INSURANCE COVERAGE, WHILE 32.8% USE PUBLIC HEALTH INSURANCE COVERAGE.[2]

Some areas of the city are less healthy to live in than others because of their proximity to environmental hazards. Low income and minority residents are disproportionately impacted by environmental hazards.

30%

FOOD INSECURITY IN DETROIT IS ESTIMATED TO BE DOUBLE THE NATIONAL RATE, APPROXIMATELY 30%.[3]

160 TONS

IN 2010, THE GARDEN RESOURCES PROGRAM COLLABORATIVE ENGAGED MORE THAN 5000 ADULTS AND 10,000 YOUTH IN THE CULTIVATION OF MORE THAN 1,200 VEGETABLE GARDENS - PRODUCING MORE THAN 160 TONS OF FOOD![4]

Data Sources: 2) Brender ET. AL. 2011 Residential Proximity to Environmental Hazards and Adverse Health Outcomes, Gochfeld and Burger, Disproportionate Exposures in Environmental Justic and Other Populations: The Importance of Outliers 2011; 3) Detroit Food Policy Council Report 2009-2010; 4) Detroit Food Policy Council Report 2009-2010

IMPERATIVES

We must focus on sizing the networks for a smaller population, making them more efficient, more affordable, and better performing.

We must realign city systems in ways that promote areas of economic potential, encourage thriving communities, and improve environmental and human health conditions.

CITY SYSTEMS ACTIONS AND IMPACT

Two clear imperatives should guide all actions for reforming city systems. First, future city systems must meet the needs of current residents much better than "business as usual." Second, the city systems must support the needs of the future city.

Detroit has opportunities that other, more constrained cities do not. City system reform offers Detroit not only an improved environment but also a much-needed change in the city's identity. Imagine a day when Detroit is renowned for its efficiency and its form: from its working landscapes that clean the air, soil, and water to its livable neighborhoods and diverse employment and retail districts, all supported by a coordinated system of transportation, utilities, and telecommunications.

"More/better mass transit, especially using alternative fuels, would reduce air pollution."

Maggie, Detroit 24/7 "Making Environmental Sense," 5/2012

WHAT WE LEARNED FROM CIVIC ENGAGEMENT FEEDBACK

- The City Systems imperative, "We must focus on sizing the networks for a smaller population...", was ranked the second-most important of all twelve imperatives.
- Top city systems strategies recorded from DWP participants included:
  - Improve public transportation for all
  - Improve/replace street lights
  - Improve public safety

STRATEGIES AND IMPLEMENTATION

LAND USE AND CITY SYSTEMS. Efficient and cost-effective systems are essential to achieving the vision of a Detroit that supports an excellent quality of life for its residents and attracts a dynamic range of new residents. Detroit's systems must be transformed to

- deliver services at a level that is appropriate for the needs of each neighborhood, employment center, or enterprise;
- be flexible enough to serve the city's current scale and meet the potential for future transformation;
- create a high-quality, accessible, attractive, and environmentally sustainable city environment while reducing resource use and reversing negative environmental impacts; and
- reduce service costs for businesses, residents, and the city government.

Achieving the vision will require changes to all aspects of systems: not only the physical networks but also the legal and regulatory bases for road financing and citywide or regional management of systems, operation and maintenance regimes, and, potentially, organizational and management structures. The Strategic Framework recognizes that systems are linked and interdependent at multiple levels. Changes in one system will often only achieve their full impact when accompanied by complementary changes in others. Furthermore, all systems changes must be directly coordinated with changes in the designation, use, and ownership of land; and in the location and scale of employment and housing.

ACHIEVING CHANGE. No single agency, public or private, can make all the changes necessary to create more sustainable services for the city, including changes governing land use, systems, charging, and

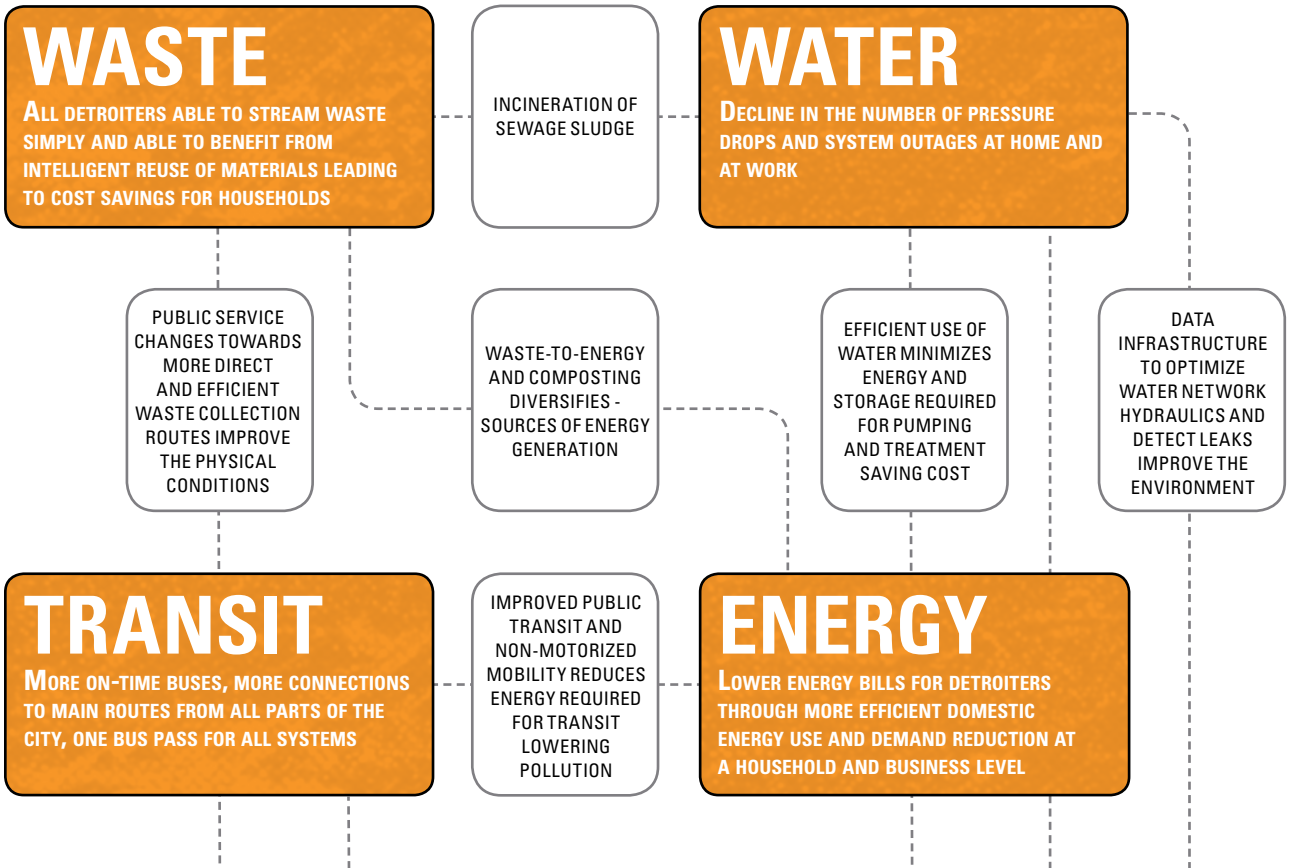
taxation. Multiple agencies acting independently are also unlikely to achieve what is needed. Change can only come through a coordinated effort by all systems agencies—both public and private—to achieve overall viability for the city and its systems through measures that reduce cost and increase revenues.

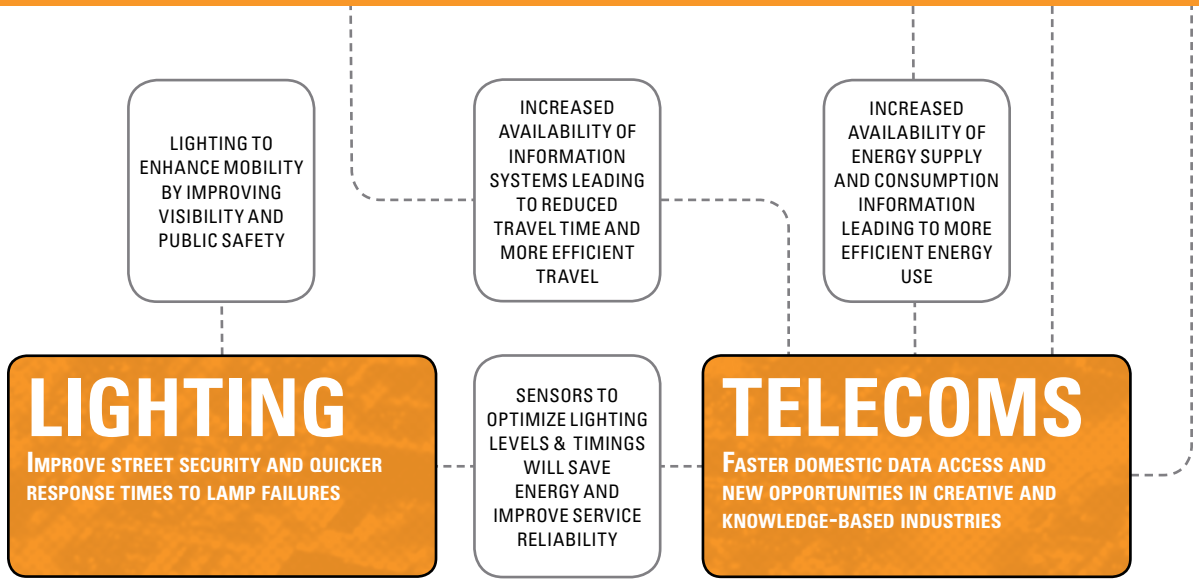
COST REDUCTION: Many City of Detroit departments and agencies are already undergoing significant reform to address management efficiencies. In some cases, maintenance and renewal cycles have also been lengthened to reduce annual expenditures. More fundamental changes may be required soon. For example, mandated service levels and areas may need to be changed to reflect actual need. Bus service for high-vacancy areas may need to be re-patterned. More broadly, as the pattern and intensity of land use changes, so to must planning, regulatory, and investment decisions change to support the city's new urban form. Closely aligned to this, intervention will be required to realign the physical scale and capacity of networks to match the changed land use patterns.

REVENUE RAISING: Direct charges for services and (to a lesser extent) taxation are the primary sources of support for the operation and renewal of systems. Set against Detroit's average household incomes and equivalent rates in peer cities, Detroit's taxation rates and charges for some services are already very high. Raising rates even further will be less successful than, instead, adopting strategies to increase the number of households in a service area. Examples of such strategies include neighborhood stabilization programs that can attract new residents and increase house values and revenues; or establishment of neighborhood retail centers to retain more spending within the city and raise additional employment and sales taxes.

The strategies set out in this chapter utilize all of these 'levers'. However, a fundamental premise of the Strategic Framework is that raising charges and taxation rates and increasing operational efficiency alone will not sustain Detroit's systems. More fundamental realignment is required to adapt to the massive changes that the city has experienced and will experience.

SYSTEM COORDINATION





This systems diagram shows the major infrastructure systems in Detroit. Potential multi-system interventions are shown and their associated quality of life benefits.

1 2 3

THREE TRANSFORMATIVE IDEAS : SEVEN IMPLEMENTATION STRATEGIES

A REFORM DELIVERY SYSTEM

Detroit's infrastructure renewal strategy addresses the need to allocate limited funds both spatially in the city—where people work and live right now—and temporally over the next twenty years, to encourage new residents and new business. This will mean upgrading network capacity in priority employment centers and neighborhoods, while reducing capacity where there is little or no demand. All investments must be guided by a clear plan that removes uncertainty around future city development and demonstrates the maximum possible cost savings for each dollar spent up front.

Reforming system delivery also means coordinating investment among all of the private and public partners involved, to prevent them from acting without reference to one another, which in turn could prevent them from duplicating efforts or making unnecessary expenditures. It also means being aware of the technical or social constraints and special needs of each particular area, so that restructuring the city is not only cost-effective but also still serves residents' needs.

IMPLEMENTATION ACTIONS

1. Use the framework plan to create certainty around residential and employment density in each area of the city.
2. Right-size systems so that network capacity matches residential and employment demand for each area in the medium term.
3. Balance investment in areas of greatest need with investment in areas of greatest potential.
4. Address equity: ensure that a good standard of core services are provided to all groups in all areas including high-vacancy areas.

1 2 3

THREE TRANSFORMATIVE IDEAS : SEVEN IMPLEMENTATION STRATEGIES

B CREATE LANDSCAPES THAT WORK

Although the City of Detroit only accounts for 12.9% of the total Detroit Water and Sewerage Department (DWSD) service area, investing in blue infrastructure within Detroit (rather than elsewhere in the region) is a valuable opportunity for the city

- to emerge as a leader in sustainable water management strategies and technologies;
- to enjoy the multiple benefits blue infrastructure offers to a city (visual amenities, increased property values, and neighborhood stabilization);
- to capture funding opportunities that exist regionally (Great Lakes Restoration Initiative funds, and other grants).

Additional benefits of blue infrastructure include flood mitigation, improved water quality and stream channel health (better for fish and other aquatic life), and recreational opportunities.

Green corridors are proposed as forest buffers that absorb carbon dioxide, particulate matter, and pollutants emitted into the air from vehicular exhaust, industrial uses, or infrastructure facilities. Improved air quality has health benefits for residents who live nearby and can provide a unique setting to attract new businesses.

IMPLEMENTATION ACTIONS

1 Deploy surplus land as multifunctional infrastructure landscapes, primarily addressing flood water mitigation and air quality.

2 Bring health and social benefits associated with landscapes and green facilities to lower income groups with poor access to transportation.

1 2 3

THREE TRANSFORMATIVE IDEAS : SEVEN IMPLEMENTATION STRATEGIES

C RECONFIGURE TRANSPORTATION

Detroit's transportation systems must be realigned to better serve the emerging needs of the future city. For example, the existing road network has significantly more space than it requires to meet current and projected traffic demand. At the same time, there is a shortage of non-motorized transportation networks for people to walk and cycle on. Paths that do exist are disjointed and less valuable than if they were connected in a single network, particularly for freight efficiency.

Detroit's transit system is in need of major reform to establish bus rapid transit (BRT) links between the main employment centers in the metropolitan area and to orient other transit types as feeders. These faster routes will offer access to a wider range of employment opportunities for Detroiters than at present, and will improve cross-town connections. During initial stages, the proposed adjustments to the network can be made at little or no additional cost. Some changes simply require a different mode of operation using the same fleets and roads—such as designating new express bus routes as a precursor to BRT or light rail. Others can be implemented on a rolling basis so that large up-front costs are avoided. The transportation network (roads and railways, as well as the vehicles that circulate on them) is as

important to quality of life as it is to accessing work, services, education, and business opportunities. In addition, Detroit's strategic location on national and international networks makes transportation improvement a potentially important industry in its own right.

IMPLEMENTATION ACTIONS

1. Realign city road hierarchy to provide faster connections between employment, district, and neighborhood centers.
2. Enhance transit service and increased ridership by realigning transit system to provide integrated network based on fast connections between regional employment centers, supported by feeder services from residential areas.
3. For higher-vacancy areas, provide smaller-scale, flexible on-demand services.
4. Align pattern of development in centers and neighborhoods to support greater number of walking and cycle trips, including promotion of greenways.
5. Support freight and logistics industries through upgrade of key routes and provision of enhanced connections across the border to Canada.
6. Provide large-scale multimodal freight interchange facilities to support local industry and overall city logistics role.

1 2 3

THREE TRANSFORMATIVE IDEAS : SEVEN IMPLEMENTATION STRATEGIES

D ENHANCE COMMUNICATIONS ACCESS

The information and communication technology industry (in its wireless incarnation) is sufficiently young that it has not suffered from the decline in Detroit's population in the same way as the other city systems. Telecoms and data companies are, in fact, still expanding their coverage of the city. In this context, Detroit has an opportunity to harness the latest technology for monitoring and real-time balancing or optimizing of city systems. On top of the management of the hard systems there are real benefits available to the delivery of public services through e-governance programs. This is quite apart from the critical support that super-fast data systems provide to some of Detroit's fastest growing industries.

IMPLEMENTATION ACTIONS

1. Ensure high-speed data networks are in place to serve existing and new economic sectors and wider community.
2. Develop e-government platform to maximize efficiency of social service delivery.
3. Utilize improved data network to develop smart infrastructure systems which deliver improved service with smaller capacity infrastructure.

1 2 3

THREE TRANSFORMATIVE IDEAS : SEVEN IMPLEMENTATION STRATEGIES

E IMPROVE LIGHTING EFFICIENCY

Of all the public services at stake in Detroit's changing population and land use patterns, public lighting is one of the most potent symbols of the scale of decline in city infrastructures. This being the case, the Public Lighting Department has embarked on an ambitious plan to both rationalize the number of active lamps in the city and to upgrade them to low-energy fittings. This has the potential to be developed further to align to the land use changes set out in the Strategic Development Framework plan. Significant organizational and financial changes—including the establishment of a separate Public Lighting Authority (PLA) to contract out maintenance and operation to a third party—are also being considered to improve service delivery and unlock funding for investment.

IMPLEMENTATION ACTIONS

1. Reduce number of lights and upgrade all remaining lights to low-energy LED type.
2. In high-vacancy areas, take some parts of the network off-grid, using solar power for generation.
3. Transfer ownership of the network to a new Public Lighting Authority which can procure services from the private sector competitively.

1 2 3

THREE TRANSFORMATIVE IDEAS : SEVEN IMPLEMENTATION STRATEGIES

F REDUCE WASTE AND INCREASE RECYCLING

Detroit's waste collection and management system is linked to the era of centralized production and distribution. New technologies for collecting and processing, along with restructured form of the city, offer opportunities to decentralize and optimize the city's waste management system. By linking waste management with transportation adjustments and land use changes, Detroit can become cleaner and more efficient. In particular, Detroit could recycle much more of its waste and develop more rigorous recycling programs.

IMPLEMENTATION ACTIONS

1. Reduce total levels of waste through citizen education and work with packaging industry.
2. Develop targeted and citywide curbside recycling program.
3. Ensure that incinerator emissions remain at or below US EPA standards and international best practice.

1 2 3

THREE TRANSFORMATIVE IDEAS : SEVEN IMPLEMENTATION STRATEGIES

G ACTIVELY MANAGE CHANGE

Each of the city system providers has been challenged by the restructuring of the city. Developing a successful response to the challenges will greatly depend on effective coordination among system operators. Such an approach to system consolidation will open up opportunities for a wider number of stakeholders to achieve efficiency and integration of services and systems. These opportunities can be understood as interdependencies (where streamlining one system facilitates operational efficiencies for another), indirect benefits (improving quality of life and environmental justice through more efficient use of space and resources), and interagency agreements (by-products of one system can be used by another).

The regulatory issues that impede effective interagency operation should be tackled, and an interagency platform established to facilitate the kind of coordinated planning that the city will need if it is to move forward from its current predicament. Although distinct, these proposals are linked because one of the best ways to structure change is via the requirements of each agency to file an annual capital investment budget for state approval. Thus, mandated levels and forms of service could be varied to align each system with the others.

Several regulatory changes to support interagency cooperation have been proposed in the past, yet have not been adopted by the city. These changes deserve renewed emphasis. Examples of this are the creation of a Regional Transportation Authority to allow for integrated public transportation policy and funding, adjustment of the current road funding mechanism (Act 51) to meet the future needs of the city, and the creation of a new Public Lighting Authority able to buy its energy from multiple suppliers and outsource maintenance contracts if necessary.

IMPLEMENTATION ACTIONS

1. Adopt Strategic Framework Plan as basis for systems transformation and put in place rolling review program.
2. Create an interagency platform to coordinate change across public and private sector bodies.
3. Communicate with affected communities and monitor processes for emerging success and unforeseen adverse impacts.

"It makes sense to proportion future investment based on where the people are."

City Systems Open House, 8/21/2012

"Land use, lighting, and water interests should be combined as an opportunity to revision our use of roads. If we could reduce the amount of roads, that would reduce the burden/fixed demand on our other systems like lighting and water."

Seniors Working Session, 2/15/2012

"There is no contradiction between a clean environment and prosperity - the new future Detroit must move energetically toward 'green.' The city needs an ordinance for mandatory recycling, both residential & commercial, in order to capture the job potential & economic value of waste stream."

Margaret, Planning Cluster-based Meeting, 2/15/2011

ENSURING EFFECTIVE TRANSITION. The strategy for reforming city systems relies on a successful transition from the existing city structures and service networks to a new pattern for meeting the demand for services in Detroit. This change is embodied in both the Land Use Element of the Detroit Strategic Framework and the differentiated investment plan proposed to accompany it.

MODELING LAND USE AND SYSTEMS TOGETHER FOR A MORE SUSTAINABLE CITY. The development of the Land Use Element took place over many months, drawing upon a large amount of data, research analysis, and community feedback. The goal was to develop a proposal for future land use that responds to the city's current needs and imperatives, yet is flexible enough to be adapted to changing realities in terms of where and how people will live and work in the future Detroit.

The Planning Team used modeling techniques to test the viability and implications of different approaches to reforming and managing city systems, as it worked to redefine the way that land is used in Detroit. The team aimed to balance the outcomes for four considerations:

- **Quality of Life / Quality of Business:** Factors that support residents in their life aspirations, and help grow the local economy. Fulfilling these factors requires some physical re-shaping of the city and protection, strengthening, and transformation of neighborhoods over the long term, in order to offer residential and employment choices throughout the city. These aspirations help to set expectations and recommendations for location and levels of service.
- **Cost to Serve:** The cost of operating and maintaining services and utilities. The relative cost of serving an area is determined by the combination of population densities and service levels.
- **Cost to Achieve:** The scale of changes in population patterns, new construction, demolition, upgrade, or other major changes in networks that is implied by the Land Use Element of the Strategic Framework, and associated strategies. Different land use strategies and the systems configurations that serve them require different levels of investment to deliver, based on the current condition.
- **Revenue:** The income generated by fees, charges and taxation that offsets the Cost to Serve and Cost to Achieve. A Revenue strategy seeks

to generate more revenue to pay for system services without increasing costs to individual users.

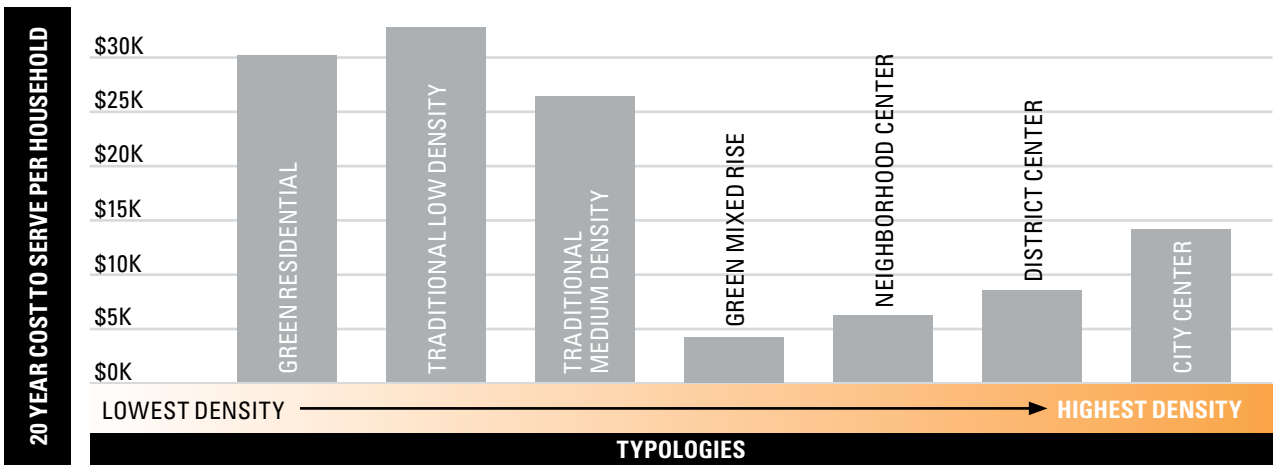
The Land Use Element of the Detroit Strategic Framework represents a blend of these four objectives in a way that is intended to offer the greatest benefits to the residents and businesses of Detroit, and that will be equitable, achievable, and sustainable. Well-established employment centers (around manufacture) are protected while emerging centers (such as the Eds & Meds quarter) are supported. Long-successful residential areas (such as those in northwest Detroit) are consolidated while areas that are less associated with mixed-use residential development (e.g. downtown) are given clear support.

Although the transitions to new and innovative land use types will take 20 years or more, there is a relatively pressing challenge now: In many areas that have experienced long-term loss of people, homes, and businesses, with high-vacancy levels or industrial abandonment, deciding the most appropriate capacity of infrastructure systems in the future cannot be put off indefinitely.

QUALITY OF LIFE / QUALITY OF BUSINESS. A focus on quality of life for residents and businesses is perhaps the most subjective but also the most important approach that the team considered. The team sought to determine how the range of Quality of Life and Quality of Business indicators could be positively supported through the type and distribution of proposed land use typologies and associated strategies.

A Quality of Life strategy focuses on stabilizing and maintaining as much of Detroit's existing urban structure and residential configuration as possible. A range of residential typologies and densities are deployed that encourage gradual changes to existing uses over time. It seeks to minimize the areas where the most dramatic changes in land use are proposed, or where substantial changes to residential densities are required, to support new typologies. Such a strategy seeks to manage transition in a way that offers choices to residents over the future of their neighborhoods. Where possible, areas currently in residential, commercial, or industrial use are preserved and strengthened while areas of relatively high-vacancy would be allowed to remain in transition for longer periods as their future role is determined. Finally, larger areas would be maintained at relatively low population densities over the long term. In adopting such a strategy a greater proportion of investment would be used to

support areas that have been in long-term decline and the application of cost reduction strategies (such as reducing, repurposing, or decommissioning city systems) would be more limited in scope.



ESTIMATED NETWORK MAINTENANCE AND RENEWAL PER HOUSEHOLD

The graph at the left illustrates the estimated cost for network maintenance and renewal per household modelled over a 20 year period. The cost of serving dwellings in low density urban areas can be as much as three times the cost of serving dwellings in high density areas.

Source: Happold Consulting, Inc. interviews with public and private service providers, excludes all 'non-network' costs.

A REFORM SYSTEM DELIVERY

COORDINATING LAND USE AND SYSTEMS

COST TO SERVE. Low-density neighborhoods (mostly single-family houses, where people usually have to drive to jobs and services) cost more to serve than more compact areas where homes, businesses, and services are located close to one another and are near transit or are accessible on foot or bicycle.

In Detroit the combination of high-vacancy levels and oversized networks operating below their capacities puts great pressure on the ability to deliver efficient, high quality, and cost-effective services. Operating city systems designed for urban populations in areas with suburban, or even rural, population densities drives up the relative cost per household of service delivery to levels that are difficult to sustain.

A Cost to Serve strategy therefore seeks to align investment approaches with the long-term transition of areas into stable residential densities, centers of employment, or alternative land uses. Reductions in capacity in low-density areas and wholesale replacement, repurposing, or even decommissioning of networks in areas that are no longer in residential use will drive cost reductions without the need to reduce the service levels to end users.

COST TO ACHIEVE. The scale of change from existing conditions implies certain levels of new construction, reuse of existing assets, and, potentially, the need for assistance or possibly programs to offer incentives to residents and businesses to locate in particular areas rather than others.

A focus on Cost to Achieve seeks to minimize costly structural changes to the city through the use of land use typologies that are sympathetic to existing conditions and patterns of land use in the city. For example, the size and number of high-density Neighborhood and District Centers would be minimized. Low-density residential typologies would be more widespread, and Innovation Landscapes areas would be restricted to the areas experiencing very high-vacancy levels.

REVENUE. The costs to change systems and deliver services are offset against the charges users pay for services and income from taxation. A large reduction

in population and employment over the years has put greater and greater pressure on revenue generation in Detroit. Maintaining aging city systems that are operating below capacity also drives up the costs to users.

A Revenue strategy therefore seeks to increase revenue generation without increasing costs to individual users. This can be achieved through increased demand from more residents and businesses within the city, increased employment income in the city, and better property market conditions. The land use planning and investment approaches must therefore support the right type of investments in the right areas to promote stabilization and future growth in city revenues.

"City services provided to less dense communities should not be subsidized by more dense ones. Communities should pay the real cost of receiving those services."

Pablo, Central/Near East Community Conversation 2, 5/5/2012

IMPLEMENTATION ACTIONS

1 Use the framework plan to create certainty around residential and employment density in each area of the city.

2 Right-size systems so that network capacity matches residential and employment demand for each area in the medium term.

3 Balance investment in areas of greatest need with investment in areas of greatest potential.

4 Address equity: ensure that a good standard of core services are provided to all groups in all areas including high-vacancy areas.

SYSTEMS FOR A CHANGING CITY

Four types of change may be required to achieve a better quality of life and business in Detroit, as well as to provide adequate services for all residents and businesses while adjusting to real demands and a changing city form:

- In almost all cases, physical systems must be transformed to reflect the changing scale and pattern of residential, commercial, and business activity in Detroit now and in the future.
- In many cases, the regulatory basis on which services are mandated or charged for will also need transformation to permit changes that are necessary but currently not permitted under current legislation.
- In most cases there are likely to be benefits available from individual utility agencies reviewing their internal processes and reconsidering whether their organizational structure is still suited to the services they will be delivering.
- Lastly, there may be further cases where end users will be better served if the number and type of agencies delivering a given service was varied (either to introduce competition where there is currently none, or to benefit from specialization and exploitation of regional / national economies of scale).

Years of constrained budgets and scrutiny by regulators have led many agencies to be more efficiently run. However, excvvessively lean running of systems that are inherently oversized will not deliver optimum performance for city or agencies. It is a vital role of the plan to now help systems agencies to understand the changing future structure of the city in order to reshape the location and capacity of systems accordingly.

UNDERSTANDING RENEWAL CYCLES. Reform of the delivery of city systems will be underpinned by how the individual systems are renewed and replaced as they start to reach the end of their design lives. Decisions about what to do with each system in each part of the city need to be made carefully around the time of a major renewal in order to avoid over-investing in an area that is running below capacity and likely to remain so, or under-investing in capacity

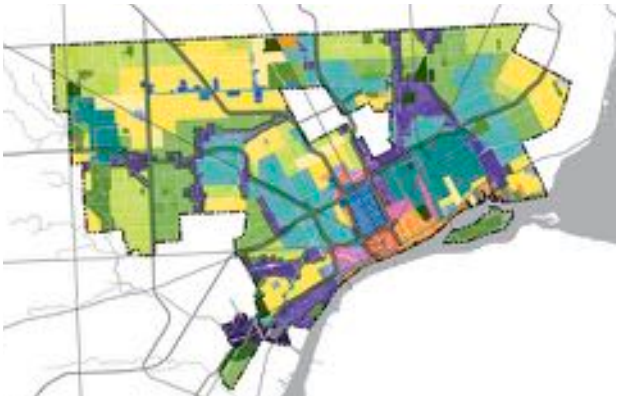
in an area that is likely to see an increase in activity in the near future. The strategic aspect of the proposed approach lies in ensuring that, for each system, these decisions are not only right for the individual system in question but are also coordinated with the other systems in the city and, in turn, with long-term land use planning for the city. The Strategic Framework is intended to be a tool that enables greater coordination than has previously been possible among city systems providers.

Providing a clear land use plan for Year 20 will enable the providers of city systems to implement a coordinated program for transition that aligns with future land use. Providers will be able to avoid expensive renewals and maintenance of aging infrastructure systems where this is not necessary (such as in Innovation Ecological and Innovation Productive areas) while maintaining and upgrading systems to support the employment centers and residential neighborhoods.

PROLONGATION OF RENEWAL DECISIONS IN SOME AREAS. A phased approach will also enable areas of lower vacancy to be stabilized as their future role becomes clear and to review and respond to how the city is changing over the next decade. The maps above show the recommended investment approaches to be applied in the city up to Year 20. As time passes, the areas with a Maintain Only approach will require decisions to be made because the age of the infrastructure will not permit indefinite prolongation of a full renewal. By Year 10, the level of service applied to all areas of the city will be determined, enabling long-term cost savings.

LIFE IN THE CITY AS THE TRANSITION TAKES PLACE. Detroit's infrastructure for utilities and transportation is linked to the location of its other important community services, including schools, health clinics, policing, and other public services. The process used to determine the investment approach for city systems in each neighborhood may also be used to locate and invest in social services there. Because these community-supportive services are critical to maintain, improve, and provide in the near term as well as over the long term, decisions about their placement and investment will necessarily involve the insight and collaboration of the communities they serve.

The matrix on pages 396-400 describes in greater detail what the different investment approaches will feel like in different parts of the city. The capacity and ways of delivering service will change, but not the level of service, which will remain at least at its current levels.

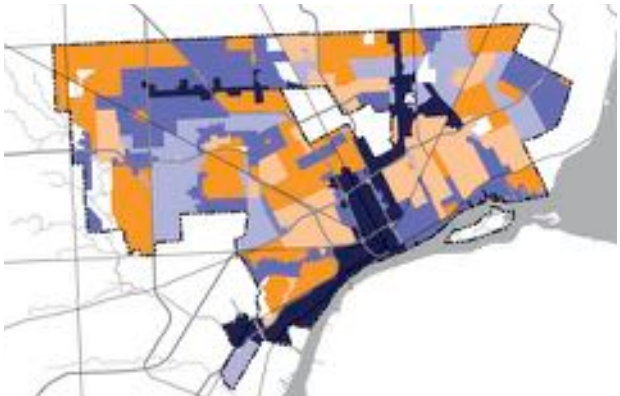


Source: DWPLTP Planning Team

1 2 4 MILES

20-YEAR LAND USE SCENARIO

The 20-Year Land Use scenario is the primary tool for coordinating the transition of the city from its current state to a more sustainable future



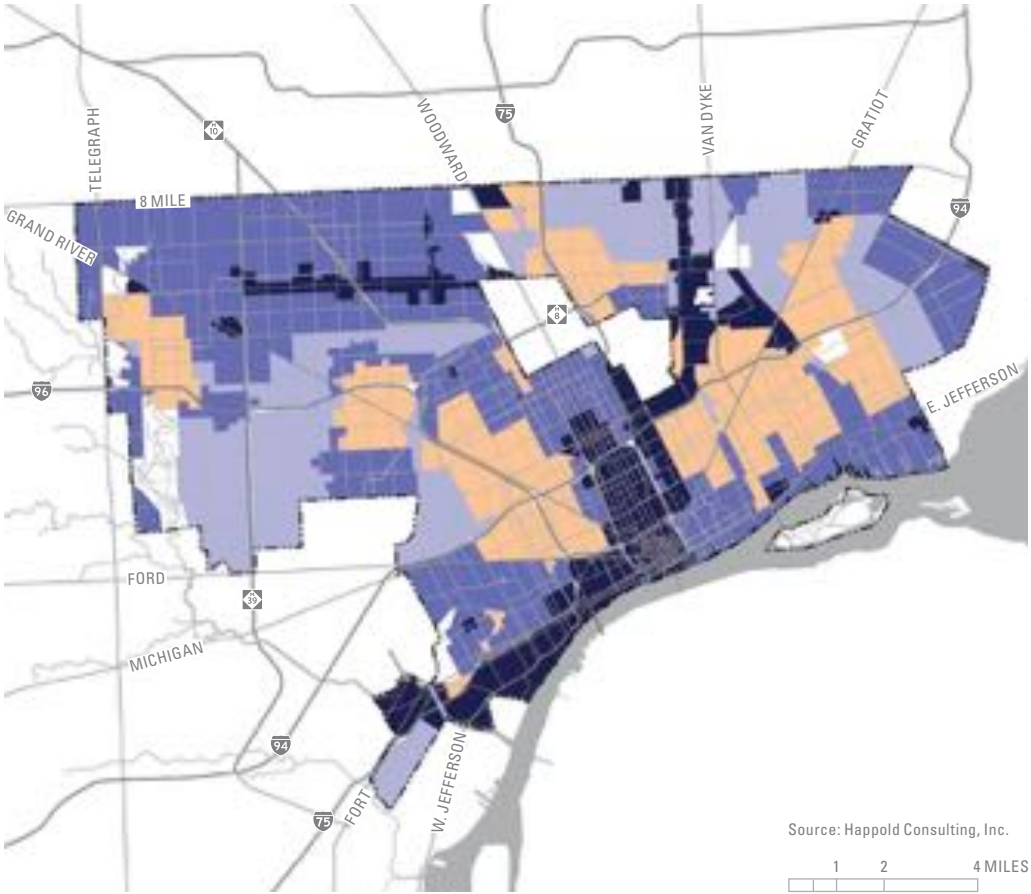
Source: Happold Consulting, Inc.

1 2 4 MILES

10- YEAR STRATEGIC RENEWAL SCENARIO

- REPLACE, REPURPOSE, OR DECOMMISSION
- MAINTAIN ONLY
- REDUCE AND MAINTAIN
- RENEW AND MAINTAIN
- UPGRADE AND MAINTAIN

In 10 years, the future of some areas of the city remains undecided. As a result of this the systems in these areas are maintained but not renewed. When a decision has been made about the future use of these areas the systems can be renewed or decommissioned.



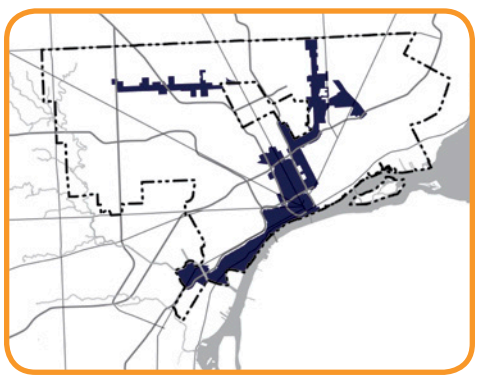
20-YEAR STRATEGIC RENEWAL SCENARIO

- REPLACE, REPURPOSE, OR DECOMMISSION
- REDUCE AND MAINTAIN
- RENEW AND MAINTAIN
- UPGRADE AND MAINTAIN

In 20 years, the use of land has been determined for all areas of the city. At this time the investment approach for each area should be reviewed a part of an ongoing planning process.

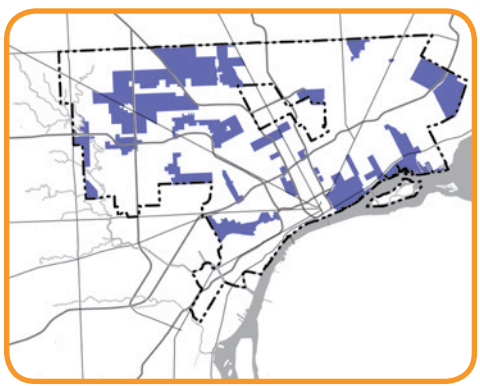
STRATEGIC RENEWAL APPROACHES SUMMARY				
UPGRADE AND MAINTAIN	**RENEW AND MAINTAIN**	**REDUCE AND MAINTAIN**	**MAINTAIN ONLY**	**REPLACE, REPURPOSE, OR DECOMMISSION**
▪ Service Level: Improved service level maintained at better quality ▪ Actions: Fully maintain and undertake renewal or upgrade as required ▪ Outcomes: Improved neighborhood with increase capacity and resilience	▪ Service Level: Core service level at the same or better quality ▪ Actions: Fully maintain and renew at current level or upgrade if required ▪ Outcomes: Viable neighborhood with same or increased capacity	▪ Service Level: Core service level but for a smaller number of residents as these areas are unlikely to regain residents to historic population levels ▪ Actions: Maintain and undertake scheduled renewal at lower capacity ▪ Outcomes: Area continues as viable neighborhood with lower capacity	▪ Service Level: Basic service level but quality declining over time ▪ Actions: Planned maintenance extending current systems life ▪ Outcomes: By 20-year horizon, systems are either renewed at full or reduced capacity	▪ Service Level: Basic service level but quality declining over time ▪ Actions: Planned maintenance to extend current systems life ▪ Outcomes: Area transitions from current use in 20-25 years. Systems eventually retired.

10-YEAR STRATEGIC RENEWAL APPROACHES



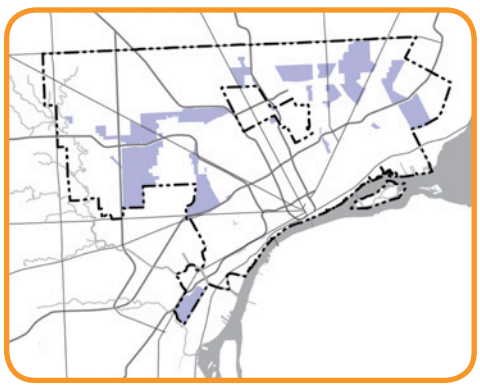
	UPGRADE AND MAINTAIN
WHERE	These areas are projected to stabilize at a level above current capacity. These areas include: City Center, District Centers, Neighborhood Centers, and Primary Employment Districts.
WATER	The water mains in these areas are likely to be comprehensively renewed and capacity added. For that reason the areas are likely, after an initial period of interruption for installment, to benefit from fewer service interruptions or changes in water pressure. This may be accompanied by measures to reduce demand at the point of consumption (e.g. dual flush toilets, recycling of rain water, etc.).
ENERGY	Areas with limited substation capacity will be prioritized for capacity upgrade. In some new industrial areas it may be necessary to assemble parcels to provide new businesses room to locate and expand, fully utilizing the upgraded energy infrastructure. Networks will be placed underground to allow for higher volumes of development and reduce the visual impact of the power grid.
WASTE	Waste disposal and treatment in these areas will be characterized by high frequency collection combined with splitting of waste into multiple streams and land-fill diversion.
ROAD & TRANSPORT	All areas designated for upgrade will see ongoing renewal of the road network. Additionally, there may be changes made to road layout and intersections as part of the implementation of a more efficient public transit network, including BRT. The focus will be on increasing the capacity and frequency of transit service to these areas while reducing the cost of delivering this service through greater efficiency. It remains possible that these areas will still have excess road capacity.

10-YEAR STRATEGIC RENEWAL APPROACHES



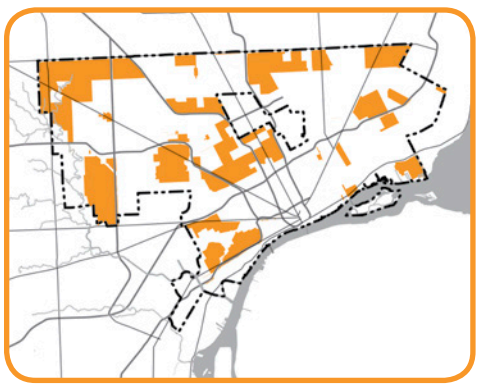
	RENEW AND MAINTAIN
WHERE	These areas are projected to stabilize at a level that is near current capacity. These areas include: Traditional Medium Density, Traditional Low Density, Green Mixed Rise, and Secondary Employment Districts.
WATER	The water mains in these areas are likely to be comprehensively renewed although they may not be targeted for the first wave of change since they are neither running massively below capacity, nor do they need additional capacity installed to allow for future development. On this basis they will ultimately enjoy a more reliable service between 5 and 10 years from now, although further decline in service quality should be halted as soon as possible.
ENERGY	These areas will see the benefits of full replacement of aging systems in line with normal replacement cycles. Since these areas are not faced with significant capacity issues there is little need to accelerate replacement. A change to below ground power lines may not be necessary in some of these areas, and as a result, many of the power lines are likely to remain above ground.
WASTE	Disposal and treatment of waste in these areas will occur at the same frequency of collection but, over time, programs will be introduced to provide curbside recycling for all areas.
ROAD & TRANSPORT	All roads in these areas will be schedule for regular ongoing maintenance and renewal. Public transit service will increase in effectiveness as services from these areas will focus on providing connections to high speed, high frequency BRT routes. Residents will enjoy access to a wider range of employment, education, and services.

10-YEAR STRATEGIC RENEWAL APPROACHES



	REDUCE AND MAINTAIN
WHERE	These areas are projected to stabilize at a level above current capacity. These areas include: City Center, District Centers, Neighborhood Centers, and Primary Employment Districts.
WATER	In these areas, investment in reducing capacity of the system should take place relatively early because of the daily costs of running the system significantly below capacity. Areas where the occupancy is already significantly below capacity but has stabilized will be prioritized over areas where population levels continue to fall. Residents in these areas will experience an improvement in quality of service and supply levels after system has been renewed at a lower capacity.
ENERGY	These areas may see a reduction in system capacity, and these reductions should be made as early as possible. One example of a reduction in capacity is currently being undertaken by MichCon in High-Vacancy residential areas. Under this pilot program MichCon is retiring every second gas supply pipe to reduce the length of supply pipes in use. Any properties that would be left stranded by this process will be re-connected to the system from the opposite side of the lot.
WASTE	Efficiencies can be found through sorting of waste into different streams. It may be that some of the more inert streams can be collected less frequently than the core waste streams.
ROAD & TRANSPORT	In areas that have experienced substantial population loss, it is difficult to offer regular public transportation service because potential ridership is too low and heavily subsidized services do not make financial sense. However, digital mobile technology offers the possibility of introducing 'on demand' transit systems that allow users to message the next mini-bus, which then adjusts its route accordingly.

10-YEAR STRATEGIC RENEWAL APPROACHES



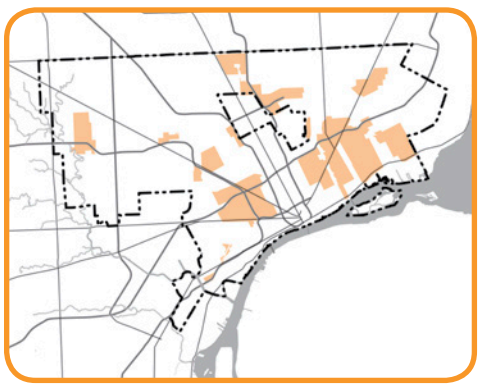
MAINTAIN ONLY

The population projections of these areas remain uncertain, but the infrastructure system could be made viable if the population levels should increase.

In a small number of areas, it is not yet clear what the future land use will be in 10 years and beyond. These areas have been given the land use Green Residential Transitional but will be reviewed at or before Horizon 2. At this point, the land use will change to a final designation, and the appropriate investment approach will be applied (upgrade and maintain, renew and maintain, reduce and maintain).

Importantly, the Maintain Only approach retains the existing systems capacity in place and keeps open all potential options for the future of the neighborhood to which it is applied. However, until such time as the decision on the final status of a neighborhood is taken, it makes little sense to invest any more than necessary in the systems. This 'wait and see' strategy should only be adopted sparingly as it is the direction given by the plan that gives public and private investors the certainty required to make the long-term decisions that are in the city's best interest. Furthermore, in some areas, the infrastructure is so old that a regime of general maintenance without a significant system renewal is no longer viable. As the systems move towards the very end of their design lives, it is inevitable that system outages and failures will become more frequent. For these areas, a clear decision to renew or decommission must be made in a timely fashion.

10-YEAR STRATEGIC RENEWAL APPROACHES



REPLACE, REPURPOSE OR DECOMMISSION

This approach is taken in areas where the land designation is expected to transition to an entirely different land use and the existing system will either be of no material use or may serve a different purpose than the one for which it was installed.

In the areas where vacancy has reached a very high level and where the land use plan designates a change of land use, it will make little sense to invest in renewing the systems. Instead, the systems within these newly designated areas will either be replaced in their entirety, repurposed and refashioned for a different function – or, in some cases, simply decommissioned. In these areas, the process of retiring the non-essential services (eg roads with 100% vacancy that are not required for through-traffic) may start before residential use is phased out completely. Thus, there will also be some pre-transition investment. For example, new green spaces may be created as former streets are converted to stormwater catchments or future amenities.

In order to provide core services to the remaining residents in these areas, it will still be necessary to maintain the systems for some time (up to 10 years). However, it should be noted that areas specifically designated as Land Use Change coincide strongly with the areas that not only have the oldest infrastructure (meaning that indefinite maintenance is infeasible) but have also experienced the highest levels of abandonment and vacancy. Where residents do choose to remain for the long term, future infrastructure service provisions will be incorporated into the systems serving the main new land use in the area.

B CREATE LANDSCAPES THAT WORK

RETHINKING APPROACHES TO 20TH CENTURY INFRASTRUCTURES

A NEW INFRASTRUCTURE SYSTEM SHAPED BY URBAN CONTEXT, TOPOGRAPHY, AND OTHER FACTORS. Blue and green infrastructure can help address water and air quality issues. The specific types of systems proposed, and their proposed locations within the City takes into account a wide range of factors, including:

- topography, especially low-lying, flood-prone areas along the Rouge and Detroit Rivers;
- availability of vacant land;
- existing stormwater system configuration, locally and regionally;
- future land use;
- air pollution sources, including facilities with air emission permits and interstates;
- soil types, which tend to be highly impervious; and
- wide roads plus traffic volume.

When it rains, the amount of stormwater that becomes runoff in an area depends on how pervious (porous) the ground is. When rain flows over grass, some of it is absorbed into the ground; when it flows over pavement, virtually all of it becomes runoff that currently enters the sewer system. Areas with more buildings and parking lots or driveways have higher amounts of runoff. During heavy rainstorms, too much runoff enters the system too quickly and exceeds the capacity of the wastewater treatment plant. The idea of the blue infrastructure network is to reduce the overall amount of runoff that enters the system and to slow down the runoff that does, so that all runoff can be fully treated by the treatment plant.

The blue infrastructure network is comprised of a series of independent systems, which vary in scale. Each system includes at minimum a place to collect stormwater. Two main types of collection area exist: retention ponds and detention basins. A retention pond is a type of collection area designed to hold

stormwater until the water is either absorbed into the ground or evaporates into the air. Retention ponds are usually wet. In Detroit, retention will work most effectively at smaller scales (for example, as rain gardens or small retention ponds no larger than a few contiguous lots). Detroit's soils are largely clay, which acts like a barrier and does not absorb much stormwater. Stormwater that enters the pond can only evaporate very slowly in a pond with a clay bottom, and if the pond is always full, it will not be able to absorb water during rain storms.

Detention basins, on the other hand, can be viable options for larger types. Detention basins are usually dry and focus on holding stormwater only temporarily. They focus on changing the rate of stormwater that enters the system. Because they will slowly release water back into the combined system, they will require infrastructure connections back to the system. The additional expense of the system connection makes detention most viable at larger scales (not worth investing in cost of reconnecting to system unless significant capacity can be achieved). By contrast, retention basins do not require connections back into the system (although they can be designed to include check dams, a feature that that redirects any overflow back into the system to prevent flooding).

Although denser areas have the most runoff, they unfortunately have the fewest opportunities for blue infrastructure. Stormwater from denser areas must be directed to other areas of the city which have available space to store stormwater. As a result, conveyance types of stormwater management complement collection types. Conveyance types carry stormwater from areas with less opportunity for collection to other areas that have more opportunities. The most common conveyance type is a swale, a grassy channel along a road that directs the flow of stormwater along the surface, instead of through pipes underground. Surface flow has two key advantages over pipes: slowed by grass and other vegetation, water flows more slowly through swales, and the vegetation also acts a filter that cleans stormwater as it passes by trapping sediment or other particles in the stormwater. Directing stormwater with gravity only, swales always run from higher elevation areas to lower elevation areas. Lower elevation areas are the most effectively locations for either retention or detention types.

Different combinations of conveyance, retention, and detention types comprise the different stormwater systems. Stormwater boulevards are citywide roads that focus primarily on conveyance. Their long length allows them to transport stormwater effectively from

one area of the city to another. Because they tend to have a variety of conditions along their length, they can collect stormwater from lower vacancy areas and transport it downhill to higher vacancy areas, where large detention ponds can temporarily hold it before slowly releasing it back into the stormwater system. Stormwater boulevards function most effectively when topography changes gradually over long distances. Most of Detroit is shaped like this; a central ridge along Woodward slopes generally down towards the eastern and western city borders. The northern end of this ridge is higher, and it gradually slopes down towards the Detroit River. Southwest Detroit, however, is characterized with a different kind of topography. It has a more mounded topography, with may different high and low points in close proximity to one another. Here, a distributed network of smaller, independent systems is more appropriate. Each smaller system includes a collection area in one of the downhill locations, which collects stormwater that runs off surrounding higher areas.

Lower vacancy areas have fewer opportunities for blue infrastructure, so in these areas, swales and small retention types are important. Small retention types retain some stormwater, and the remaining runoff can flow into swales, which will transport it to other areas with more opportunities for blue infrastructure. Higher vacancy areas can have many, larger detention basins.

Transitions between areas of higher and lower vacancy offer important opportunities for blue infrastructure. Here, the adjacency between an area of high runoff and an area of high opportunity for collection reduces the need to transport stormwater long distances. In these cases, the edge of high-vacancy can have a high prevalence of collection areas. These “wet buffers” work most effectively if the high-vacancy area lies downhill from the denser area. However, if the opportunities for collection are up-hill, they can still collect any runoff that has flowed across the high-vacancy area. In this case, it is important to catch the stormwater before it enters the lower vacancy area with fewer opportunities to collect it. In a similar way, wet buffers can also help collect stormwater at abrupt changes in topography. For instance, most interstates in Detroit are sunken, so any stormwater that flows down one slope of an interstate will become trapped. Here, a high concentration of ponds on the upper edge of an interstate can collect runoff before it flows into the interstate.

IMPLEMENTATION ACTIONS

1 Deploy surplus land as multifunctional infrastructure landscapes, primarily addressing flood water mitigation and air quality.

2 Bring health and social benefits associated with landscapes and green facilities to lower income groups with poor access to transportation.

PILOT PROJECT

1 Blue Infrastructure — see Land Use chapter

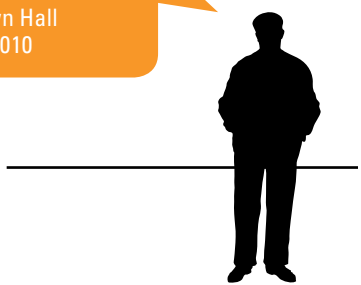
PRECEDENTS

1 Decentralized Infrastructure : Philadelphia, PA

2 Integrated System : Wilsonville, OR

"Any new initiatives should strive to reduce pollution. Detroit is one of the most polluted cities in America. 48209-48217 being the worst. Clean, green, healthier environment /no more emissions or smoke stacks!!!"

Rolando, Town Hall Meetings 9/2010



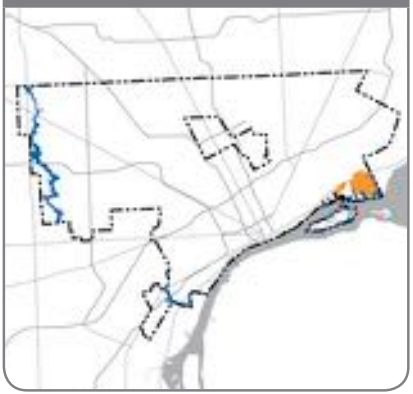
"You can smell gases from factories and see all of the smoke these factories are producing. It's sick because they are harming the environment and also causing health problems to the citizens living here."

Adreanna, Detroit 24/7, 5/2012

BLUE AND GREEN INFRASTRUCTURE CAN HELP ADDRESS THESE ISSUES:

TOPOGRAPHY

FLOOD PRONE AREAS



REGIONAL STORMWATER

BLUE AND GREEN INFRASTRUCTURE CAN HELP ADDRESS THESE ISSUES:

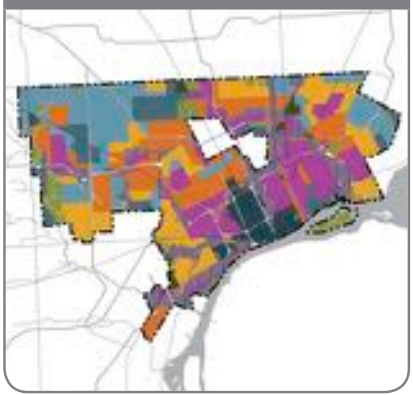
WATER SYSTEM CONFIGURATION

WIDE ROADS

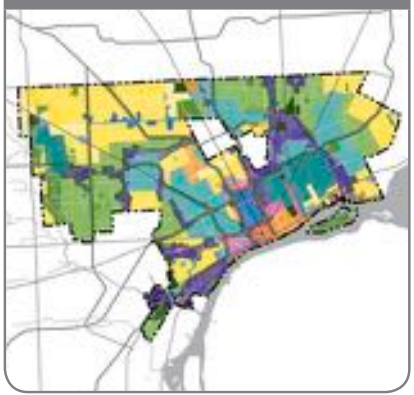
AIR EMISSIONS SOURCES

BLUE AND GREEN INFRASTRUCTURE CAN HELP ADDRESS THESE ISSUES:

FRAMEWORK ZONES



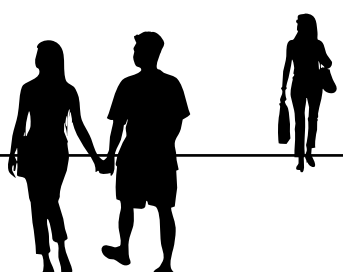
FUTURE LAND USE



PUBLICLY OWNED LAND

"I could really see this infrastructure setting Detroit apart from other cities. Communities could participate in maintaining this infrastructure, and I can foresee it providing jobs."

John, City Systems Open House, 8/21/2012

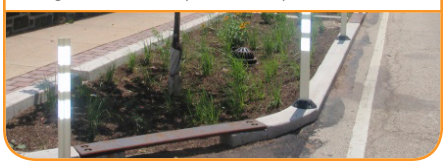


PRECEDENT

DECENTRALIZED INFRASTRUCTURE

Philadelphia's updated stormwater regulations encourage urban infill through exemptions for redevelopment projects. On-site stormwater management with vegetated systems provide a range of benefits.

Image Source: Philadelphia Water Dept.



PRECEDENT

INTEGRATED SYSTEM

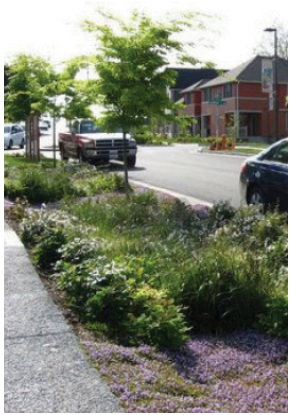
Wilsonville protects functional open space at the community scale and introduces green infrastructure at smaller site scales. The City directs development charge revenues toward projects that protect healthy waterways and restore degraded streams.

Image Source: US Geological Survey

1.

2.

3.

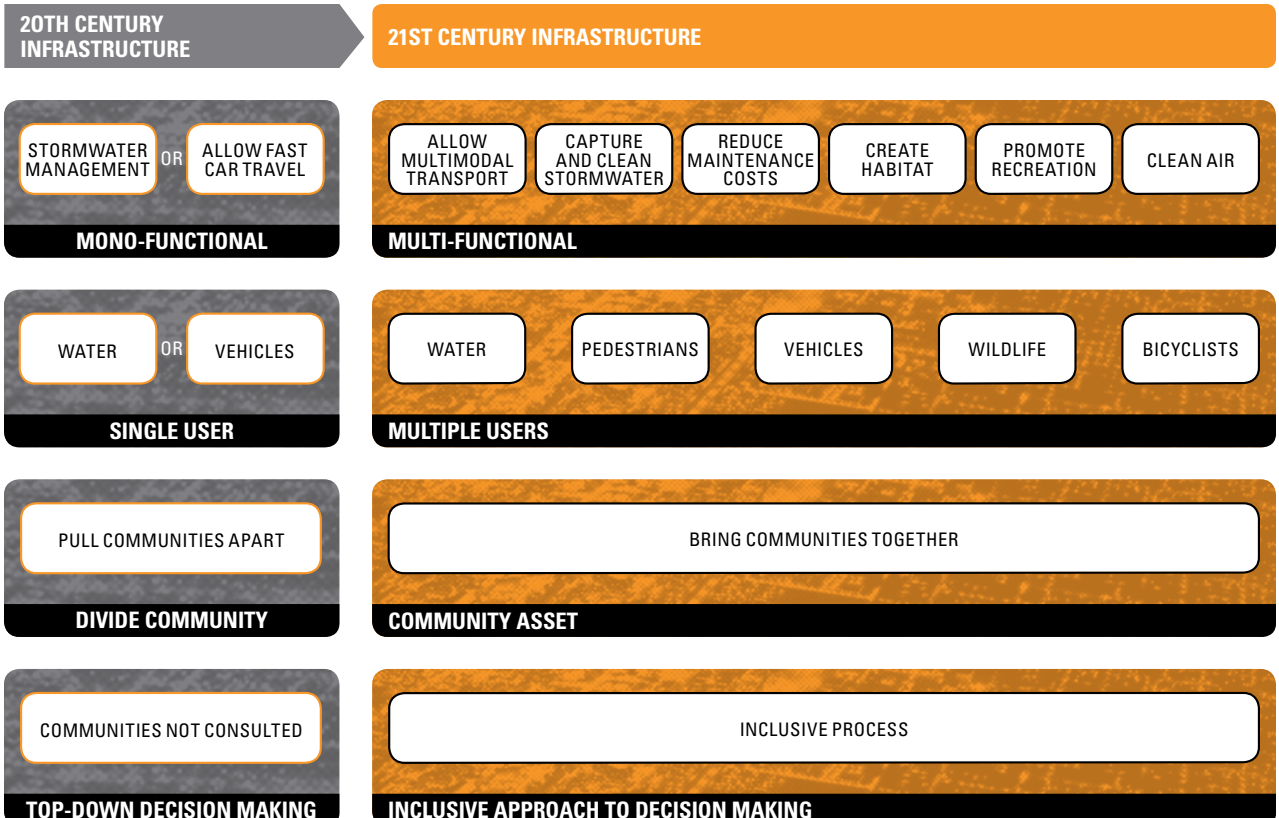


4.

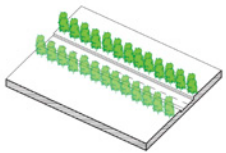
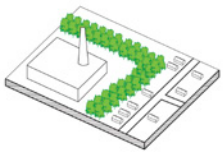
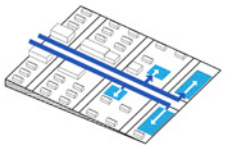
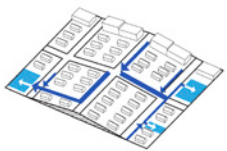
20TH CENTURY INFRASTRUCTURE

21ST CENTURY INFRASTRUCTURE

Image Sources: 1) Sean Marshall, Wikimedia Commons; 2) Marvin Shaouni; 3) Lamiot, Wikimedia Commons; 4) US Environmental Protection Agency


20TH CENTURY INFRASTRUCTURE
21ST CENTURY INFRASTRUCTURE
STORMWATER MANAGEMENT
OR
ALLOW FAST CAR TRAVEL
MONO-FUNCTIONAL
ALLOW MULTIMODAL TRANSPORT
CAPTURE AND CLEAN STORMWATER
REDUCE MAINTENANCE COSTS
CREATE HABITAT
PROMOTE RECREATION
CLEAN AIR
MULTI-FUNCTIONAL
WATER
OR
VEHICLES
SINGLE USER
WATER
PEDESTRIANS
VEHICLES
WILDLIFE
BICYCLISTS
MULTIPLE USERS
PULL COMMUNITIES APART
DIVIDE COMMUNITY
BRING COMMUNITIES TOGETHER
COMMUNITY ASSET
COMMUNITIES NOT CONSULTED
TOP-DOWN DECISION MAKING
INCLUSIVE PROCESS
INCLUSIVE APPROACH TO DECISION MAKING

BLUE / GREEN INFRASTRUCTURE TYPES

	CARBON FOREST	INDUSTRIAL BUFFER	STORMWATER BOULEVARD	SURFACE LAKE	DISTRIBUTED NETWORK
ILLUSTRATION					
DESCRIPTION	Forests that repurpose vacant land around expressways and abandoned rail corridors.	Forested areas that repurpose vacant land around industrial uses.	Citywide, broad, retrofitted streets that include swales along their length and intermittent roadside detention ponds (primarily in high-vacancy areas). Character of blvd adapts to different urban conditions along their length.	Large, low-lying vacant areas allow for flooding to create lakes, which provide significant retention capacity for storms; swales and other surface conveyance mechanisms direct stormwater into these areas.	Multiple independent networks of swales and other surface conveyance elements that direct stormwater to small and medium-scale retention/ detention ponds in lower lying areas.

BLUE / GREEN INFRASTRUCTURE TYPES

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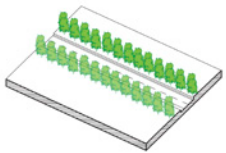
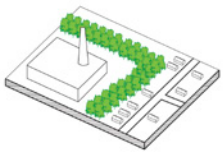
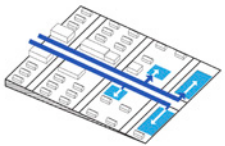
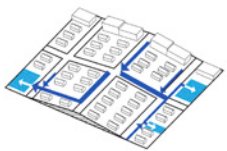
ILLUSTRATION					
FUNCTION	Absorb carbon dioxide, particulate matter, and other pollutants in vehicular exhaust emitted into the air by car and truck traffic.	Reduce the impacts of industrial uses on nearby residential neighborhoods, by absorbing air-borne pollutants, reducing sound, blocking light/ glare, and providing a visual barrier. Buffers also act as an amenity to firms by creating a more attractive, healthy business environment.	CONVEYANCE AND DETENTION Collect stormwater from many areas of city and transport to areas with road-side detention ponds for holding and slow release back into the combined system.	HIGH CAPACITY DETENTION / RETENTION Topography naturally directs surface runoff to these areas, making them suitable for capturing stormwater.	CONVEYANCE AND DETENTION The topography of these areas calls for multiple independent systems to collect stormwater from higher areas and direct it towards lower areas.

BLUE / GREEN INFRASTRUCTURE TYPES

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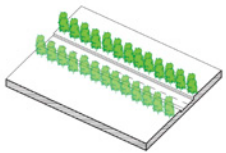
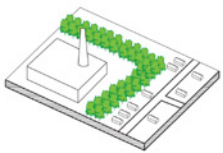
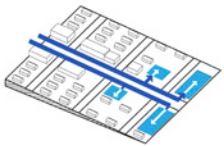
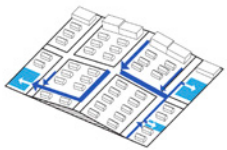
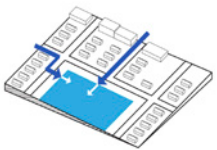
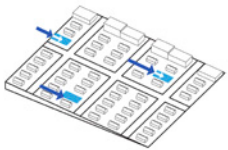
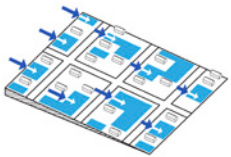
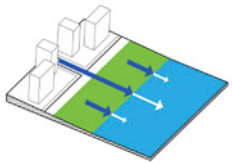
ILLUSTRATION					
LOCATION	Extend 500 feet from the edges of expressways.	Buffer widths vary depending on the scale, intensity, and type of industrial use as well as the character of the adjacent land. General buffer widths are 200 feet.	Primary corridors: Radial arterials (Woodward, Jefferson, Gratiot, Grand River) and proposed Ring Road connecting employment districts. Secondary corridors: McNichols west of Woodward and 7 mile east of Woodward .	Internal depressions in city's topography in high-vacancy areas, and potentially moderate-vacancy areas.	Areas with greater internal variation in topography, like Southwest Detroit. These areas have many high points and low areas in close proximity to one another.

BLUE / GREEN INFRASTRUCTURE TYPES

	INFILTRATION PARK	DISPERSED PONDS	CONCENTRATED PONDS	WET BUFFER	RIVER MARSHLAND
ILLUSTRATION					
DESCRIPTION	Parks that combine stormwater management with recreation.	Small ponds, rain gardens, or other small-scale blue infrastructure within neighborhoods or employment districts that can fit within 1-2 average-sized residential lots.	Many small to medium ponds in close proximity to one another in higher-vacancy areas.	High concentration of ponds at significant edges between framework zones or along interstates.	Treatment wetlands and vegetated buffer strips in parks and vacant lots.

BLUE / GREEN INFRASTRUCTURE TYPES

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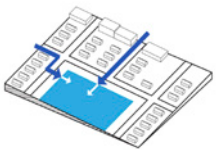
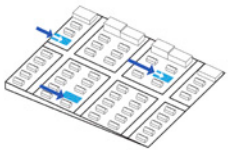
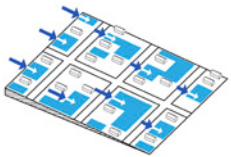
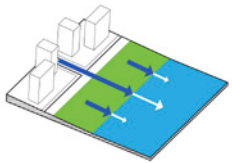
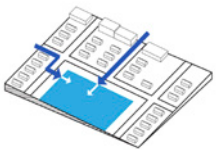
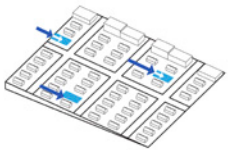
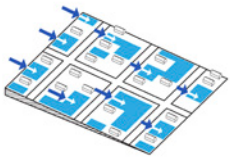
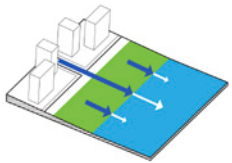
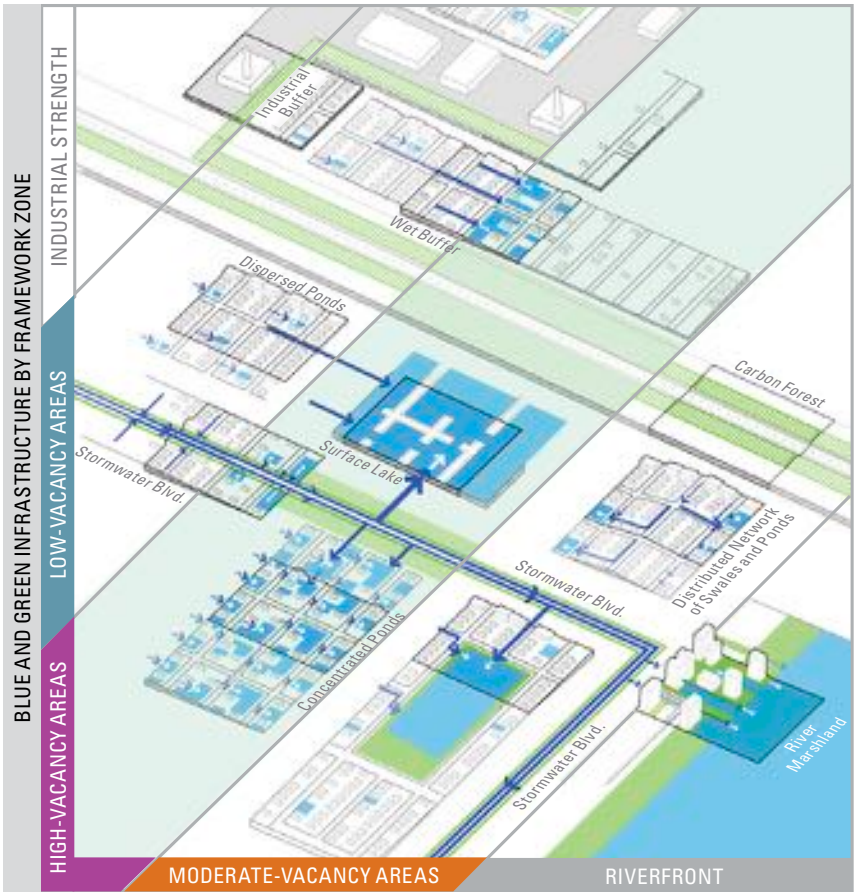
ILLUSTRATION					
FUNCTION	DETENTION/ RETENTION Reduce maintenance costs, repurpose limited maintenance parks and provide additional sources of funding/ maintenance for parks (potential for partnerships between DRD and DWSD).	SMALL-SCALE RETENTION AND NEIGHBORHOOD Stability / Visual Amenity	HIGH CAPACITY RETENTION	DETENTION AND NEIGHBORHOOD STABILITY Wet buffers catch runoff before it enters an area of lower vacancy with fewer opportunities for blue infrastructure, or immediately after runoff leaves an area of lower vacancy.	RETENTION AND TREATMENT Treat stormwater before it flows into the Detroit or Rouge Rivers; these components are a last chance to capture and clean stormwater before it enters the rivers. Wetlands and buffer strips also create additional aquatic habitats.

BLUE / GREEN INFRASTRUCTURE TYPES

	INFILTRATION PARK	DISPERSED PONDS	CONCENTRATED PONDS	WET BUFFER	RIVER MARSHLAND
ILLUSTRATION					
LOCATION	Limited maintenance parks are good candidates to be retrofitted as infiltration parks, but parks in high-vacancy areas, low-lying areas, or river-front parks may be considered as well.	Low- or moderate-vacancy areas; should especially be prioritized in land depressions that are not candidates for surface lakes because there is not enough residential vacancy.	High-vacancy areas, especially areas near the Rouge or Detroit Rivers, land situated to capture runoff from many low-vacancy areas that do not have many opportunities for retention within them, and along downhill edges of high-vacancy areas.	On up-hill interstate edges and the high-vacancy sides of edges between framework zones.	Parks and vacant lots along or near the Detroit or Rouge Rivers.



WATER RETENTION / DETENTION / INFILTRATION
PARK
FOREST AND BUFFER
ECOLOGICAL AREA
CONVEYANCE (SWALE)
RUNOFF FLOW

As the conditions in the city vary from area to area so will the appropriate elements of a blue infrastructure system. However, these elements must link together to form a larger network to capture and clean stormwater.

BLUE INFRASTRUCTURE

Blue infrastructure networks capture and clean stormwater runoff from all areas of the city and reduce the frequency and magnitude of combined stormwater/sewage discharges. Each system type works in a different way that is appropriate for different kinds of topographic and urban conditions. Downhill, higher vacancy areas function as major collection areas, detaining stormwater from uphill areas of the city with lower vacancy (and higher runoff). Swales connect major runoff-producing areas to collection areas.

Blue infrastructure has the potential to reduce runoff that enters the system, but other challenges must be addressed as well, including:

EXISTING, LENGTHY PURCHASING AND PROCUREMENT PROCESS: slows repair process when malfunctions occur;

STAFFING: personnel shortages / training deficiencies (too few people, especially in management positions, and this problem will only worsen as many in department retire in near future); and

Source: Stoss Landscape Urbanism

LEGAL CONSTRAINTS: currently, state policy does not allow cities to use blue infrastructure to meet long-term control requirements; only hard infrastructure is seen as acceptable way to reduce overflows.

Procurement processes and staffing shortages impact "hard" infrastructure today, and blue infrastructure will likely face similar challenges. Training and education will be important components of implementing blue infrastructure to ensure DWSD staff are comfortable and familiar with maintaining blue infrastructure. State-level advocacy will be needed to overcome legal constraints.

GREEN INFRASTRUCTURE

Green infrastructure networks improve resident health. Carbon forests are the primary example, because they repurpose vacant land around highways and rail corridors to absorb carbon dioxide, particulate matter, and other pollutants in vehicular exhaust, emitted into the air by car and truck traffic and trains. The recommended minimum width for carbon forests is 500 feet. Beyond this distance, the negative health impacts of pollutants in vehicle exhaust drop off sharply. The carbon forest can begin within the right-of-way of the existing interstate (set back from the edge of the interstate as required by state law for vehicle safety) and extend beyond the right-of-way as land is available, ideally creating a 500 ft forested band. Actual width will vary based on the availability of vacant land.

Some green infrastructure can be integrated within neighborhoods, just as blue infrastructure can. Landscape can be a new basis for creating new kinds of urban lifestyles in areas rich with recreational and other outdoor opportunities. Other areas need industrial buffers that repurpose vacant land to created protective, forested zones around industrial

Source: Stoss Landscape Urbanism

1 2 4 MILES

GREEN INFRASTRUCTURE

- CARBON FOREST
- INDUSTRY BUFFERS
- GREENWAYS

uses. Green landscapes can also be economic assets, offering job opportunities related mostly to their construction and maintenance.

The scale and type of landscaping depends on the scale and intensity of neighborhoods or industries. Specific buffer widths will vary according to available land, but general suggested buffer widths are

- Live+Make: No Buffer
- Light Industry: 200 ft buffer
- General Industry: 1,320 ft buffer
- Heavy Industry: 2,640 ft buffer

Innovative uses of land in Detroit do face technical and legal barriers. Just as conventional infrastructures in Detroit are outdated and inefficient, traditional forms of green space and water features need upgrading and updating. Individual lot and block structures are restrictive and must be met with a range of proposed landscapes adaptable to multiple scales and to overlay existing traditional city grid patterns.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36

There were 36 combined sewer overflow discharges into the Detroit River in 2011.[1]

(combined stormwater/sewer system)

EXISTING: CURRENT WATER SYSTEM CONFIGURATION

LEGEND

BLUE INFRASTRUCTURE

- COMBINED SEWER/ STORMWATER
- WATER FLOW DIRECTION
- DRAINAGE/OUTLET AREAS
- WASTE WATER TREATMENT PLANT

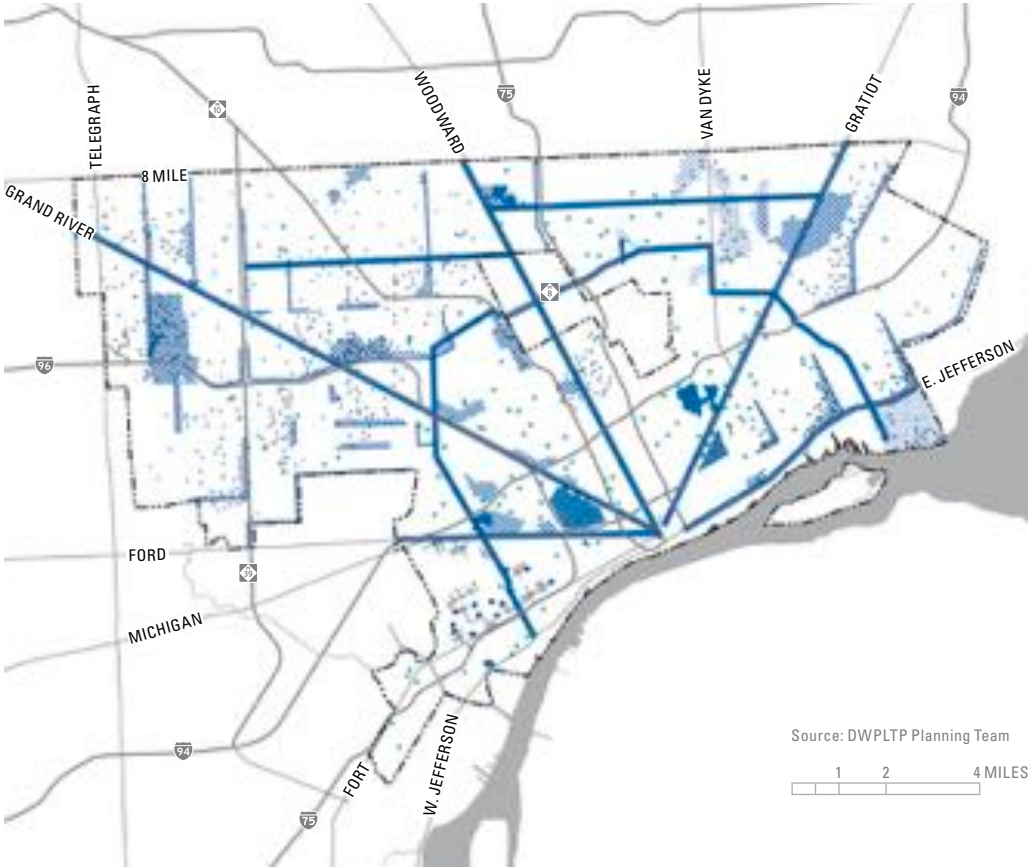
The existing water system in the city routes stormwater toward the Waste Water Treatment Plant in southwest Detroit. During periods of heavy rain fall this system can become overwhelmed and discharge untreated sewage into the Detroit and Rouge Rivers.

Data Source: 1) Detroit Water and Sewerage Department

1 2 3 4 5

A comprehensive citywide blue infrastructure system could have prevented all but 5 of these discharges.[1]

(combined stormwater/sewer system)



PROPOSED: 2030 BLUE INFRASTRUCTURE SYSTEM

LEGEND

BLUE INFRASTRUCTURE

- STORMWATER BLVD
- SURFACE LAKE
- WET BUFFER
- DISTRIBUTED NETWORK
- HIGH CONCENTRATION PONDS
- DISPERSED PONDS
- INFILTRATION PARK

A reimagined infrastructure system will contain a range of blue infrastructure elements that can clean our water and air and help to improve quality of life for residents.

Source: DWPLTP Planning Team

1 2 4 MILES

Data Source: 1) DWPLTP Planning Team

C RECONFIGURE TRANSPORTATION

REALIGNMENT WITH THE CITY. The highest priority for systemwide change is transportation or mobility. Detroit is heavily car-dependent (over 85% of trips are taken by car) and while the Motor City legacy may persist for several decades to come, real change is happening now. Rising fuel prices and environmental issues are starting to bite. Dispersed job centers limit access and choice of employment for working and low-income families without cars. This means that diversifying the transportation options (for both people and freight) is fundamental.

One of the best ways to reduce transportation-related pollution and increase quality of life (as well as business attractiveness) is for more people to live near to where they work and thus make shorter commutes. Detroit faces a challenge in this respect because 62% of Detroiters are currently employed outside of the city, with average commute times of over 40 minutes. Only when there are greater levels of employment within the city can this be addressed. Therefore the transformation of the transportation network should not only respond to the largely unplanned restructuring of the city that has taken place in recent decades but should also be used to promote and support a planned economic restructuring that can bring more employment into the city in the future. The improved system needs to be provided in a way that is affordable in the short term and in a way that is flexible in the medium term in order to respond to change further down the line.

CONNECTIVITY AND QUALITY OF LIFE. Transportation connects city residents to jobs, and also to public services (health and education) as well as places of recreation and entertainment—all of which contribute strongly to their quality of life. Changing the role and speed of routes in the city will be vital to enhancing access across a wider range of transport modes. Detroit's movement systems for people are primarily road based. These roads must accommodate not only cars but also public transit, freight, and non-motorized movement.

Detroit has a very large road capacity but does not provide optimal connections. Although highways take traffic efficiently through the city or from downtown to points in the suburbs, these highways sever the city internally, disconnecting neighborhoods and undermining social connections as well as connections to jobs. As the population lessens in the foreseeable future, it will be more important than ever to "right-size" the road network and integrate it with other modes and design changes that to allow faster access and a more coherent, connected feeling throughout the city.

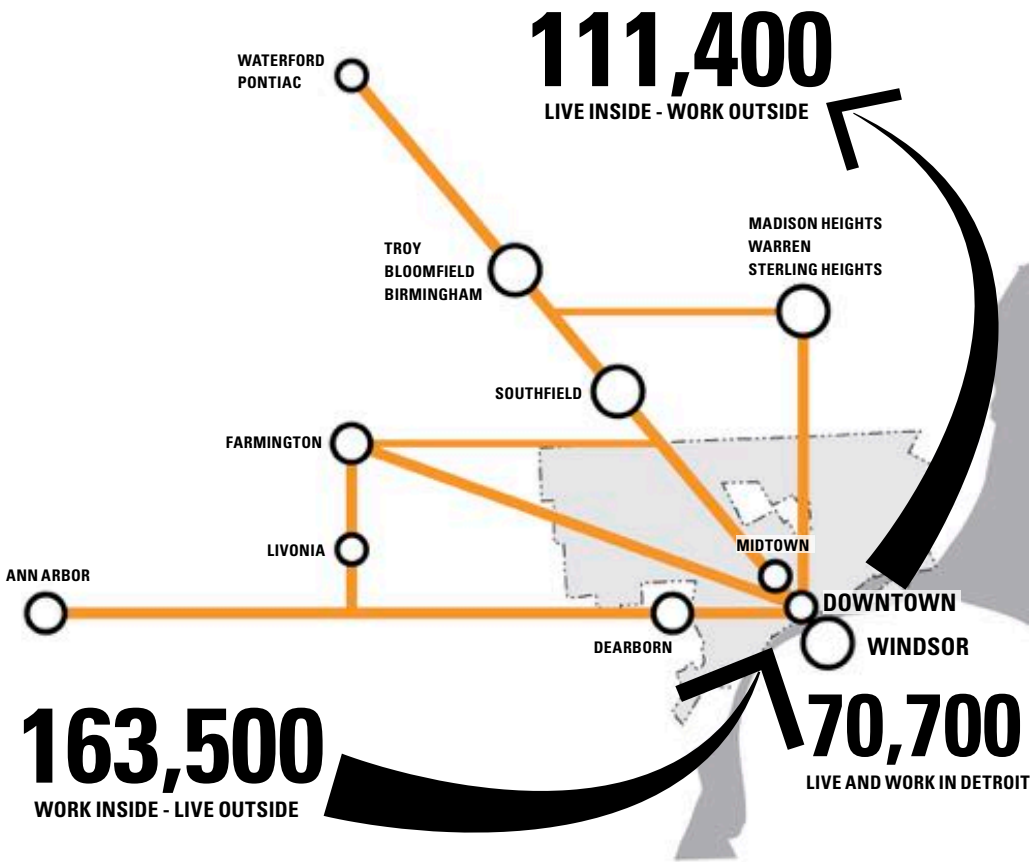
Freight movement, logistics, and waste processing have important direct consequences for quality of life in the city (such as environmental impact) as well as indirect consequences (such as an improved and therefore healthier business environment). As Detroit moves to a more multi-centered urban pattern, the hierarchy of routes for freight and waste processing must be examined and defined to best serve traffic into and through the new city as the hub of a regional network.

"[We] need a regional transit authority that is well funded to cover operational cost."

City Systems Open House, 8/21/2012

"Will the system realistically link inner-city workers to suburban job markets? There are not enough jobs in the city."

David, City Systems Open House, 8/21/2012



REGIONAL COMMUTER FLOW

TRANSIT CONNECTIONS
EMPLOYMENT CENTERS

As well as travel within the city, today's Detroiters require good access to employment centers outside of the city, in neighboring counties.

Data Source: 2010 Longitudinal Employer-Household Dynamics

BUS

TIER 1 BRT ROUTES

Fast, long distance routes
High capacity BRT
Scheduled services

TIER 2 CROSSTOWN ROUTES

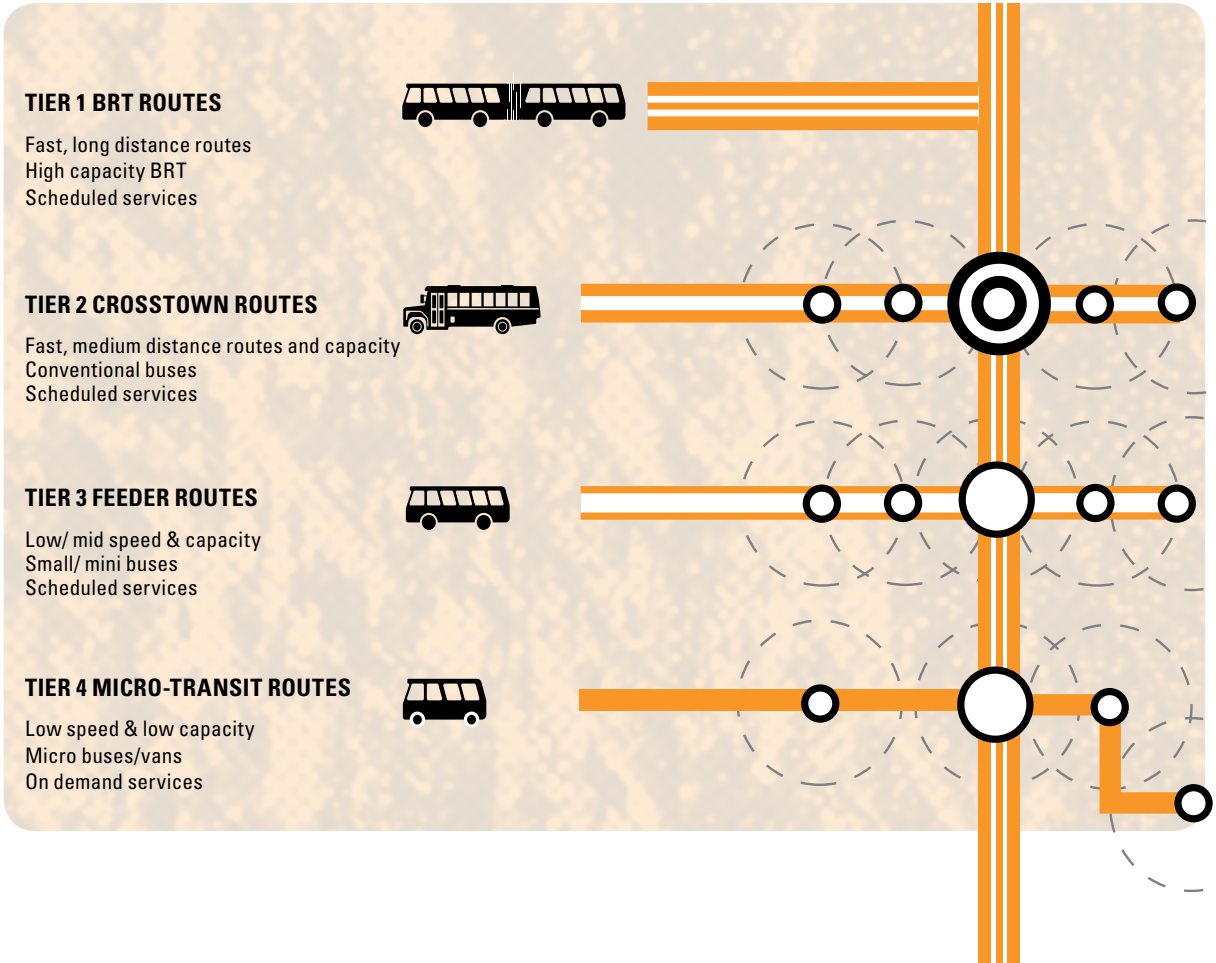
Fast, medium distance routes and capacity
Conventional buses
Scheduled services

TIER 3 FEEDER ROUTES

Low/ mid speed & capacity
Small/ mini buses
Scheduled services

TIER 4 MICRO-TRANSIT ROUTES

Low speed & low capacity
Micro buses/vans
On demand services



RAIL

LIGHT RAIL

Mid speed & high capacity
Connecting within city center
Frequent scheduled services

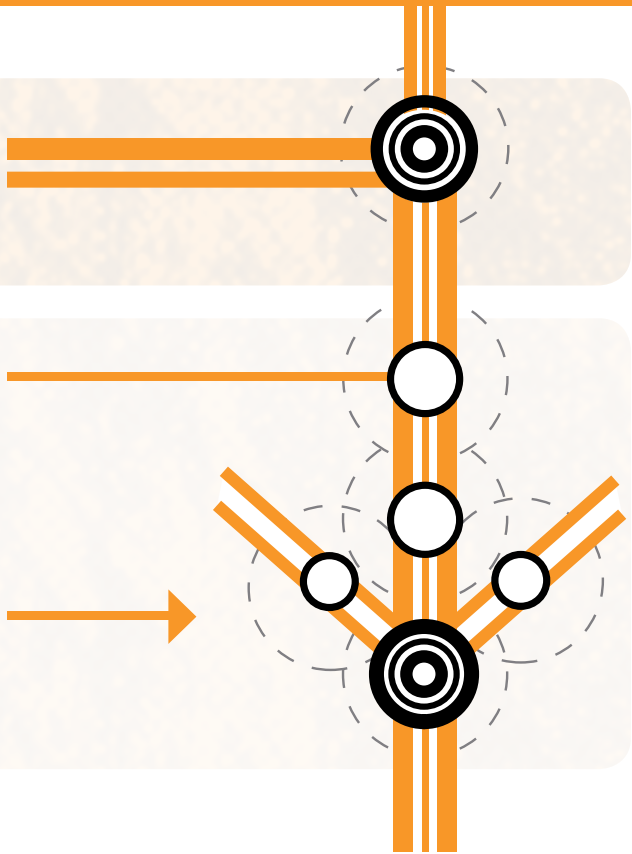
NON-MOTORIZED

NON-MOTORIZED

Low speed and low capacity
Bikes and shared vehicles

WALKING

10 minute (half mile) walk defines catchment of most transit stops



As Detroit adapts to a more multi-centered configuration, rapid movement between urban centers will be critical to the success of the city. Each mode of transportation offers a different mix of capacity and speed. Different modes can address the needs of different levels of density and proximity to employment or service centers.

NETWORK ADJUSTMENTS. The following changes proposed to the system can all be commenced incrementally and without large investments. Local impacts will be felt immediately but the greatest change will be felt once the networks reach a maturity that allows simple, reliable multimodal transport for all residents at a reduced cost.

Insert an intermediate layer in the road hierarchy and introduce a ring-road — providing faster connections across the city. This should be reflected in both the road network and the transit system that runs on it. The current inefficient pattern of mid-scale transit routes serving all areas of the city at similar speed and occasionally in parallel should be replaced by a clear, tiered system of rapid transit routes linking the major employment centers in and beyond Detroit, supported by smaller feeder routes.

- Make space available for other modes, particularly dedicated lanes for faster transit services, and bicycle lanes.
- Support the development of non-motorized modes for shorter journeys or as the start and end portions of longer ones. This will require focused development of enhanced sidewalk provision in key activity centers as well as the development of an integrated network of greenways and cycling routes linking centers to one another and to residential areas.
- Decommission surplus capacity so that it no longer imposes a maintenance burden. This may mean closing minor roads in areas which have fallen vacant or reducing lane capacity on major roads—allocating surplus to green space or landscape infrastructures.

PLANNING FOR INTERCHANGES. For both transit and freight, the development of a multimodal and hierarchical system presents challenges and opportunities at the interchange locations. These crossing points can stimulate economic activity as a result of the increased traffic or the emergence of transit oriented development although the emphasis must always be upon easy interchange between transport modes. In some cases the logistical and spatial requirements for an effective interchange may require a significant investment. As a result, while the system generally should anticipate change the interchange points are likely to be more long-lived and should seek a loose- fit relationship to any future changes.

PILOT PROJECT

ROUTE HIERARCHY

Establish a new route hierarchy in which neighborhood bus routes feed express bus-routes along main artery roads. The express route will follow routes targeted for future BRT, but will initially utilize existing buses and travel on existing rights of way.

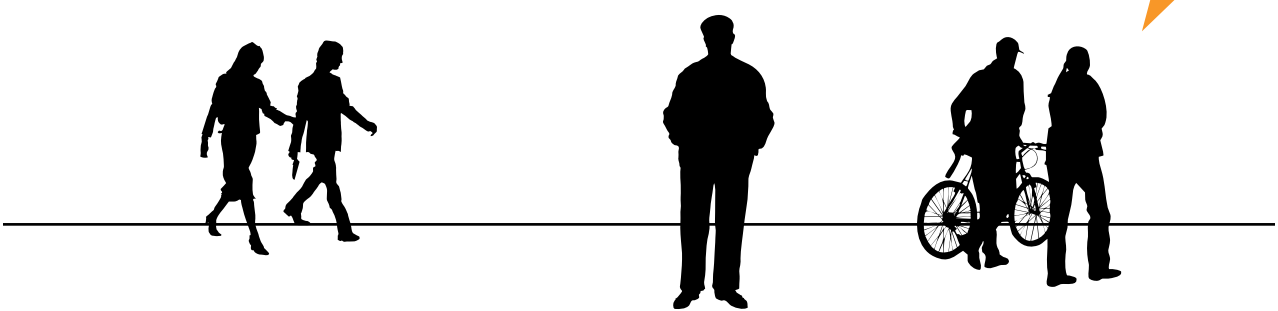
Image Source: http://www.dbarchitect.com/words/

"Have you considered the possibility of converting roads to half capacity - so as to be only used non-motorized vehicles? Maybe they would be only half a lane, instead of closed?"

Transportation & Infrastructure Working Session, 6/7/2012

"As we put down more bike lanes, people are starting to use more alternative transit."

Transportation Working Session, 2/10/2012



9% PUBLIC TRANSIT

87% MOTORIZED PRIVATE

4% NON-MOTORIZED

EXISTING: CURRENT PUBLIC TRANSIT ROUTES

LEGEND

PUBLIC TRANSPORTATION TIERS

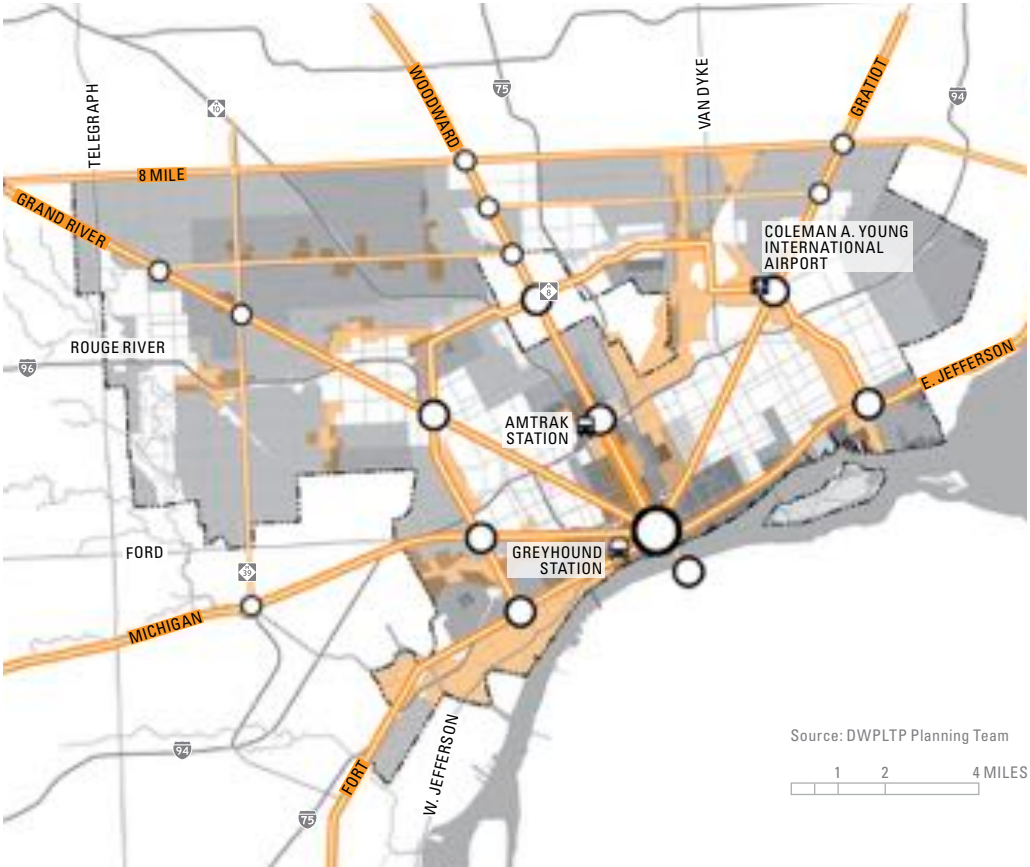
DDOT BUS ROUTES

Detroit's existing transit network makes insufficient distinction between local and express routes.

30% PUBLIC TRANSIT

60% MOTORIZED PRIVATE

10% NON-MOTORIZED



PROPOSED: 2030 PUBLIC TRANSIT ROUTES

LEGEND

PROPOSED PUBLIC TRANSIT BY TIER

- LIGHT RAIL
- TIER 1 BRT ROUTES
- TIER 2 CROSSTOWN ROUTES
- EMPLOYMENT DISTRICTS
- TRANSIT NODES

PROJECTED 2030 POPULATION DENSITY

- 0–2 PEOPLE PER ACRE
- 3–6
- 7–10
- 11–14
- 15–18
- >19

A simpler and more reliable transit system creates space for alternative modes of transportation and provides for faster transfer between those modes.

REGIONAL FREIGHT ROUTES

- INTERMODAL YARD
- AIRPORT
- P PORT
- RAIL ROUTE

Detroit's strategic position makes it an important freight hub for North America. Links to Windsor and five adjacent cities offer potential for Detroit to enhance facilities in the Transportation, Distribution, and Logistics sector and increase employment.

"What are plans to expand the airport? We are missing an opportunity to generate funds from a more fully operational facility. Point-to-point flights and international trade should be explored."

Beverly, Town Hall Meetings, 9/2010

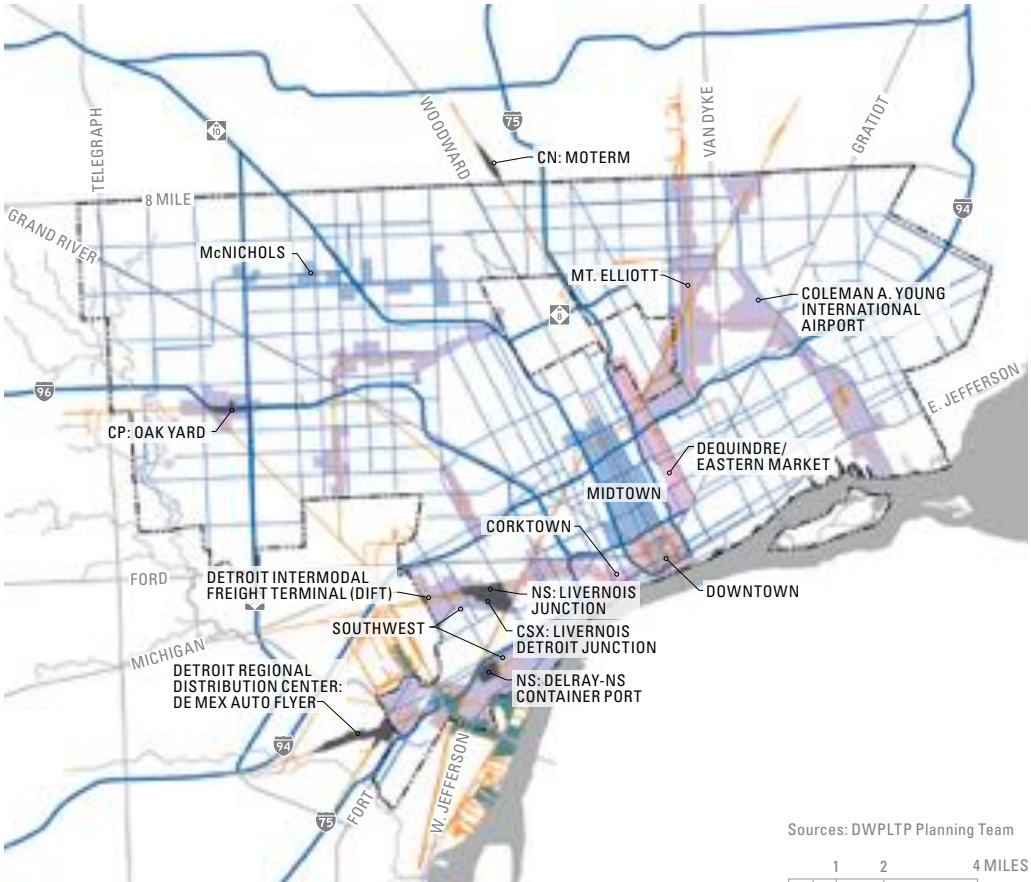
Source: Happold Consulting, Inc.

0 4 12 MILES

FREIGHT. Efficient freight movement to and within the city is essential to Detroit's economic performance. Beyond this, Detroit has the strategic position and legacy networks to be a freight hub of continental significance. Building, or renewing, the world class freight movement hubs in Detroit has the capacity not only to serve Detroit industry but to become a major source of employment and wealth creator in its own right. To achieve this, Detroit must reorganize its freight networks at city level.

- Reinforcing the main freight routes and facilities, particularly the upgrade of key road and rail routes (such as I-94 upgrade and upgrade of the main rail interlockers). In addition, it will be important to expand the capacity of international crossings as well as Detroit's air and water gateways.
- Creating interchanges, which allow the efficient transhipment, breakdown, and repacking of freight between different routes and different modes. Projects such as the Detroit Intermodal Freight Terminal (DIFT) will be essential to support this.
- Connecting Detroit businesses to the primary freight network, ensuring that the city road network and railroad spur system is sufficient for Detroit businesses to seamlessly access main freight routes or key interchanges—reinforcing Detroit's image as an attractive business location.
- Support the consolidation of DTW (Detroit Metro Airport) as a major international hub or 'aerotropolis' and ensure that the links between the airport and Detroit are sufficient to ensure that city businesses and jobs benefit. Additionally, Coleman A. Young Municipal Airport should be optimized to ensure maximum connectivity between the city and the surrounding region for local freight and package movements.
- Reinforce the capacity of the port facilities to service the industrial clusters in the southwest of the city and ensure transport connections between the facilities and the clusters are integrated with the wider networks.

Achieving these projects will require coordinated action among transportation system agencies, logistics operators, and city and regional authorities in order to identify key routes and interchange points, acquire the required land for system upgrade and to develop combined funding approaches.



DETROIT FREIGHT NETWORK

- INTERMODAL YARDS
- MARINE PORT FACILITIES
- FREEWAY
- TRUCK ROUTE
- RAIL ROUTE

EMPLOYMENT DISTRICTS

- DIGITAL AND CREATIVE
- EDS AND MEDS / DIGITAL AND CREATIVE
- INDUSTRIAL / CREATIVE
- GLOBAL TRADE / INDUSTRIAL

A simpler and more reliable transit system that creates space for alternative modes of transport and provides for faster interchange between those modes. The southern part of the city hosts a large range of facilities for handling freight.

IMPLEMENTATION ACTIONS

1. Realign city road hierarchy to provide faster connections between employment, district, and neighborhood centers.
2. Enhance transit service and increased ridership by realigning transit system to provide integrated network based on fast connections between regional employment centers, supported by feeder services from residential areas.
3. For higher-vacancy areas, provide smaller-scale, flexible on-demand services.
4. Align pattern of development in centers and neighborhoods to support greater number of walking and cycle trips, including promotion of greenways.
5. Support freight and logistics industries through upgrade of key routes and provision of enhanced connections across the border to Canada.
6. Provide large-scale multimodal freight interchange facilities to support local industry and overall city logistics role.

PILOT PROJECT

1. Route Hierarchy

D ENHANCE COMMUNICATIONS ACCESS

HARNESSING NEW CONNECTIVITY

Detroit currently has good levels of coverage by communications and data services. Unlike other city systems, the rise in demand for data has been so great that growth in systems has been possible even as the population has declined. This underlying situation allows the national regional service providers involved to justify continued investment in the network. However, Detroit must aim high. In future, a constantly upgraded, high quality base communications network will be essential to underpin the transformation of Detroit in order to enable smarter delivery of services, smarter use of infrastructure and the development of new economies.

In the future Detroit will have limited budgets while retaining a significant number of vulnerable residents within the city. Excellent communications will be essential to delivering life quality improving services within financial constraints. Examples of this include development of e-enabled service delivery for transportation systems including real-time transit information and facilitation of low cost on-demand services for those living in high-vacancy areas or vulnerable groups as well as development of e-government to include a wide range of public services.

The use of new technologies can also improve utilization and resilience of physical networks enabling them to be reduced in size. Examples of this include development of smart grids for utility systems which enhance utilization and reduced resource use or development of transportation management systems which allow greater efficiency from smaller infrastructures, such as integrated traffic signal control.

Lastly, many of the future economic growth sectors on which the resurgence in Detroit's employment levels depend, are underpinned by very high speed, high volume data and communications links. This will require investment in additional capacity to ensure that key employment and academic centers within Detroit have access to world class data ICT connections in terms of speed and capacity.

IMPLEMENTATION ACTIONS

1 Ensure high-speed data networks are in place to serve existing and new economic sectors and wider community.

2 Develop e-government platform to maximize efficiency of social service delivery.

3 Utilize improved data network to develop smart infrastructure systems which deliver improved service with smaller capacity infrastructure.

PRECEDENT

1 Sustainable Dubuque: Dubuque, IA

PILOT PROJECT

1 Transit Phone App

PRECEDENT

SUSTAINABLE DUBUQUE

The City of Dubuque launched Sustainable Dubuque in 2009. The program brings together IBM Research, utilities providers, smart-meter suppliers and community groups to provide residents with real-time feedback on energy and water consumption.

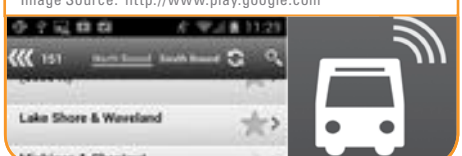
Image Source: http://www.sustainablecitynetwork.com

PILOT PROJECT

TRANSIT PHONE APP

Development of a multi-modal integrated transportation mobile application that facilitates trip planning within and beyond the city. This can pre-date the establishment of a Regional Transport Authority (RTA) and should also accommodate non-motorized transportation.

Image Source: http://www.play.google.com



E IMPROVE LIGHTING EFFICIENCY

FLEXIBLE SOURCING FOR IMPROVED PERFORMANCE

Detroit's public lighting network has been particularly affected by the loss of population and tax base in the city Plans for its reform are important in and of themselves, but also to demonstrate progress and change in the city's systems management approach. Until recently, the city-owned network provided power via its own generation stations to the city's public lighting and public buildings. Rising costs, falling revenues, and aging infrastructure forced the PLD to draw back from generation and did not provide sufficient funds to maintain the network. By 2012, only 35,000 of 85,000 light fittings were in working order. In response to this, the city government has proposed a comprehensive plan incorporating physical transformations and organizational changes.

The proposed reduction in number of light fittings from 85,000 to approximately 45,000 includes the removal of lights in alleyways and removal of extra light poles on residential streets. More efficient light fittings (including LEDs) will replace the remaining ones, supplemented by "off the grid" technologies such as solar-powered lights for sparsely inhabited areas. The city government plans to selectively upgrade and enhance lighting provision along main thoroughfares and within key city and district centers. An upgrade program has already been partially implemented within the Downtown and Midtown areas.

Continued support should be given to the transfer of ownership of the public lighting network to a private body able to outsource operations and maintenance, and with independent financial powers.

These proposed transformations will make a major contribution to creating a network that aligns physically with the city's current needs and fiscal capacity. This plan can be built on to serve the needs of the future city by providing targeted upgrades in neighborhood and district centers, while further reducing lighting provision in transition areas of high-vacancy as they are vacated.

IMPLEMENTATION ACTIONS

1 Reduce number of lights and upgrade all remaining lights to low-energy LED type.

2 In high-vacancy areas, take some parts of the network off-grid, using solar power for generation.

3 Transfer ownership of the network to a new Public Lighting Authority which can procure services from the private sector competitively.

PILOT PROJECT

1 Weatherization and Energy

PRECEDENT

1 Public Lighting Outsourcing

"In many areas on the East side of Detroit, the street lights are not working. We need to investigate the light poles and make sure there is not structural damage to the lights. Having all of the lights working at night will decrease the chance of robberies and car jackings."

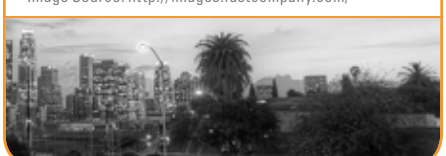
Alvera, Detroit 24/7, 5/2012

PILOT PROJECT

WEATHERIZATION AND ENERGY

The district-level weatherization and energy demand reduction program is delivered by a joint venture Energy Services Company (ESCo) formed by public authority and private providers. Results are measured, monitored, and evaluated in a citywide program.

Image Source: http://images.fastcompany.com/



F REDUCE WASTE AND INCREASE RECYCLING

TOTAL WASTE MANAGEMENT

Detroit currently operates a centralized approach to waste management. Regular collection services, provided by the City of Detroit Department of Public Works (DPW), particularly for residential customers and public buildings and by private collection services for commercial enterprises, bring the majority of nonindustrial waste generated in Detroit to the City's incinerator, operated by Greater Detroit Resource Recovery Authority (GDRRA). The GDRRA recovers some materials, such as metals, for recycling and generates electricity as well as steam, which is fed to the Detroit Thermal network. For the next ten years, the City of Detroit has secured a lo west-price-match guarantee for processing City-collected waste whereby the incinerator will match the lowest price offered by any alternative provider (currently $25/ton).

In recognition of the environmental imperative to recover a greater proportion of the materials within Detroit's waste streams, DPW has piloted curbside recycling programs to deliver waste to the advanced materials recovery facility north of 8 Mile. The emerging changes in Detroit's population, economy, and land use will lead to reducing overall volumes of waste and changing composition of the waste stream. Reducing waste volumes potentially means reduced efficiency for collection routes and reduced levels of locally sourced fuel for the incinerator, prompting the need for greater waste streams from outside Detroit.

The Strategic Framework recognizes that Detroit's waste management approach will evolve over time to meet the changing structure of the city and emerging environmental requirements. Key initiatives will be as follows:

- Mitigate environmental impact of existing waste streams, ensuring that planned upgrades to the incinerators' emission control systems are implemented to be compliant with rising U.S. EPA and international best-practice requirements.

- Minimize waste generators: Engaging with residents, businesses, and packaging producers to identify pathways to reduce total waste levels;
- Constantly review waste collection routing in order to achieve greatest possible efficiency in context of changing city population and economic activity patterns; and
- Increase coverage of targeted curbside recycling programs to cover all future residential neighborhoods in the city. Recycling programs should continue to utilize metro Detroit's existing high standard materials recovery facilities.

"The most effective strategies that I think are happening in the city are introducing recycling to students in public schools. . . . It teaches kids like us how to treat the environment and keep it healthy and well looked after."

- Zarin, Detroit 24/7, 5/2012

IMPLEMENTATION ACTIONS

1 Reduce total levels of waste through citizen education and work with packaging industry.

2 Develop targeted and citywide curbside recycling program.

3 Ensure that incinerator emissions remain at or below US EPA standards and international best practice.

PILOT PROJECT

1 Waste Streaming and Incentive Program

PILOT PROJECT

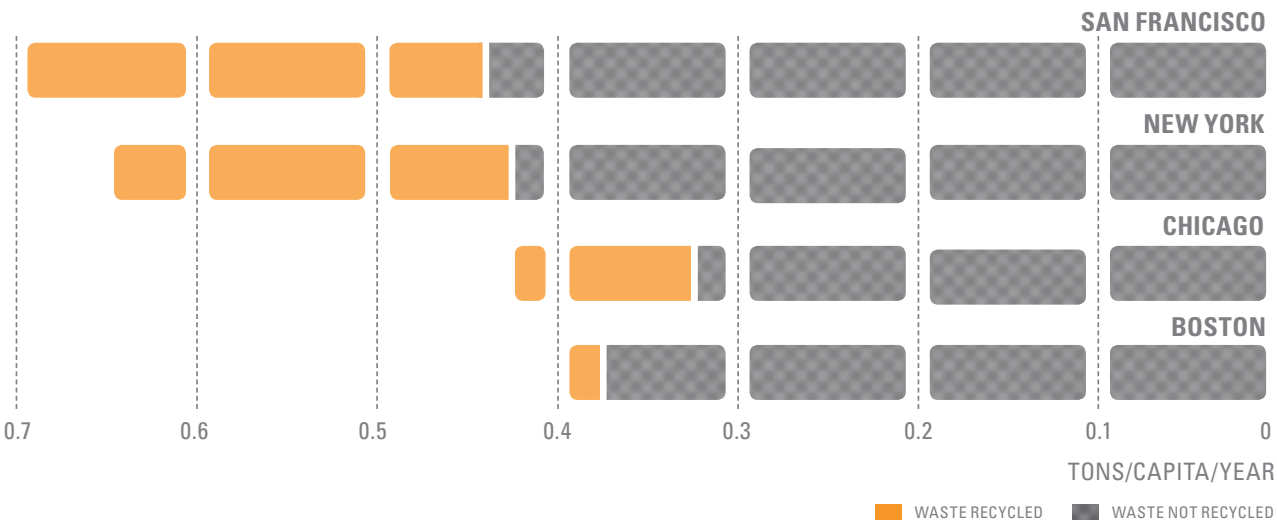
WASTE STREAMING AND INCENTIVE PROGRAM

A district-level waste streaming and incentive program is delivered by a joint ventured formed by public authority and waste collection companies, including demolition and construction waste firms.

Image Source: http://www.designswan.com/

WASTE PRODUCED & RECYCLED IN DETROIT

WASTE PRODUCED + RECYCLED IN OTHER U.S. CITIES



G ACTIVELY MANAGE CHANGE

ORGANIZATIONAL SUPPORT FOR PHYSICAL CHANGE

ORGANIZING FOR LONG-TERM CHANGE. Detroit's systems will be transformed gradually over time. There is no affordable model for the instantaneous remodeling of all of the systems of a large city. Transforming the systems will require smart thinking that identifies the optimal rate of change. Compared to the typical lifespan of social and economic trends, infrastructure systems have a very long service life extending up to 50 years. Nevertheless, long-term decisions for different parts of the network are taken every year as rolling programs of investment are directed to particular areas and system elements. In this context, long-term change must start now. This will require effective and transparent management and, in some cases, organizational change in order to drive through the totality of changes described.

The systems transformations set out in the plan are likely to require organizational change on two fronts: Making changes to the laws, regulation and mandated levels of service that govern the jurisdiction, service provision and financing of systems in Detroit on the one hand, and reconsidering investment priorities to directly impact the maintenance, upgrade or decommissioning approach of each network on the other. An example of the first type of regulatory change would be to take legal steps to permit the creation of a Regional Transportation Authority, while an example of the second type of change would to push for changes to the way in which construction and maintenance of roads is funded by the state and by the national government.

RESPONSIBILITY FOR AND IMPACT OF INDIVIDUAL SYSTEM CHANGES. The Strategic Framework provides the basis for reaching a coordinated approach between all stakeholders, residents, businesses and system providers. This will cover changes to the physical infrastructure or operational approach of individual systems to place them on a more efficient and sustainable basis and coordination of investment decisions and service delivery between agencies so that they can undertake the long-term planning and delivery of major investments with the necessary level of certainty.

Although the responsibility for implementing each individual change is unlikely to be shared between system providers, it should be acknowledged that the results of each change will be felt by other systems. There are three different types of interaction: Inter-dependencies (streamlining one system facilitates operational efficiencies for another), Indirect benefits (improving quality of life and environmental justice through more efficient use of space and resources) and Interagency operation (using the by-products of one system in another).

Sources: Strategic Operating Alternatives Report to the Greater Detroit Resource Recovery Authority, 2009 Lalonde, Suzanne, "Big City Recycling," Proceedings - 2003 Solid Waste/Recycling Conference of the Federation of New York Solid Waste Associations.

IMPLEMENTATION ACTIONS

1 Adopt Strategic Framework Plan as basis for systems transformation and put in place rolling review program.

2 Create an interagency platform to coordinate change across public and private sector bodies.

3 Communicate with affected communities and monitor processes for emerging success and unforeseen adverse impacts.

PRECEDENT

1 GIS Database: Cleveland, OH

EARLY ACTION

1 Regional Transit Authority

MANAGING CHANGE OVER TIME

5 YEARS

CITY PLAN

- Adoption of Detroit Strategic Framework
- Create interagency platform for key infrastructures

ORGANIZATIONS

- Internal agency reforms (rationalization of operations and outsourcing where appropriate)
- Establish Regional Transit Authority (RTA)

NEIGHBORHOODS

- Apply differentiated investment approaches according to Strategic Framework Plan

PHYSICAL NETWORKS

- Reconfiguration of service patterns where this can be achieved inside existing agency mandates and using existing hardware /vehicle fleets etc.
- Implementation of pilot projects

Managing change should take place at four key levels and be phased realistically over time. Different periods of time will be busiest for different types of activity.

10 YEARS

CITY PLAN	▪ Review of Detroit Strategic Framework ▪ Review and update systems coordination plan
ORGANIZATIONS	▪ Legislative reforms for agency mandates and / or funding structures ▪ Development of formal interagency coordination mechanisms
NEIGHBORHOODS	▪ Review impact of differentiated investment approaches ▪ Apply final investment approaches to areas where decision has, until now, been left open temporarily
PHYSICAL NETWORKS	▪ Review of impact of reconfigured networks ▪ Delivery of major priority projects

Managing change should take place at four key levels and be phased realistically over time. Different periods of time will be busiest for different types of activity.

PRECEDENT

GIS DATABASE

Cleveland's Geographical Information Systems (GIS) database is the City's foundation for managing system assets. It can also can serve as the platform for a comprehensive strategy combining age of infrastructure and maintenance costs with projected population and block capacity.

20 YEARS

CITY PLAN	▪ Second review of Detroit Strategic Framework ▪ Review and update systems coordination plan
ORGANIZATIONS	▪ Consolidation of interagency coordination mechanisms
NEIGHBORHOODS	▪ Second review of impact of differentiated investment approaches
PHYSICAL NETWORKS	▪ Second review of impact of reconfigured networks and development of plans for consolidation with upgraded hardware and more permanent networks

Managing change should take place at four key levels and be phased realistically over time. Different periods of time will be busiest for different types of activity.

EARLY ACTION

REGIONAL TRANSIT AUTHORITY

Establish a regional transit authority (RTA) for the main parts of the metropolitan area, including Detroit. The RTA will take responsibility for planning, integration, strategic operation, and investment decisions for all types of transit services across the metro area.

Image Source: http://www.riderta.com

CREATE AN INTERAGENCY PLATFORM. Overall success will depend heavily on effective coordination among service providers, both public and private, to enhance efficiency, integrate systems, allocate resources wisely, and reduce costs. The Strategic Framework recommends that an interagency platform be created to serve as a forum for coordinating the reform of systems that serve Detroit, and as a single point of contact for engagement with the many groups engaged with the transformation of the city, including public and private system agencies, civic groups, municipal planning organizations, and the nonprofit sector. The platform will allow all of the service agencies, public and private, to come together on a regular basis to:

- assess detailed changes and trends within the city in terms of economy, population, and changing land use and system demand;
- agree on common plans for future system development and investment;
- coordinate operation and management;
- coordinate maintenance and renewal work; and
- evaluate the impacts of change on individual communities, as well as review opportunities for mitigation.

PHASING AND HANDLING CHANGE OVER TIME. There are many reasons why the physical changes to the systems should be phased over time. Service providers should ensure provision of alternative approaches to service provision ahead of any system withdrawal or reconfiguration. Operators should prioritize areas where upgrade or land use change is most urgent and support longer-term approaches in areas where the development strategy or land use opportunities are not fully clarified. Innovative development concepts can be explored through small-scale pilot projects in the short term to test the viability of larger-scale deployment in the medium to long term.

The chart on pages 446-448 shows a general approach to the phasing of the systems transformations at four different levels: The implementation of the Strategic Framework, organizational change, neighborhood change, and the physical changes to the networks or city systems.

CIVIC ENGAGEMENT. Communicating the important details of the system change and the rationale behind it to the city residents is of paramount importance. Detroiters should know what is going to happen and why. They should also have the opportunity to place their points of view in a process that

effectively and equitably responds to the sometimes conflicting demands that underlie the need for systems to support economic growth, quality of life, environmental justice, and fiscal sustainability in as balanced a way as possible.

SERVICE	PROVIDER
ELECTRICITY	Detroit Edison (part of DTE) Public Lighting Department (PLD)
GAS	Michcon (part of DTE)
HEAT	Detroit Thermal (part of Thermal Ventures)
POTABLE WATER	Detroit Water and Sewerage Department (DWSD)
DRAINAGE	Detroit Water and Sewerage Department (DWSD)
STORMWATER DRAINAGE	Detroit Water and Sewerage Department (DWSD)
WASTE COLLECTION	Department of Public Works (DPW)
TELECOMS AND DATA	AT&T and other private providers
STREET LIGHTING	Public Lighting Department (PLD)
INTRA CITY PUBLIC TRANSPORT	Detroit Department of Transport (DDOT)
SUBURBAN PUBLIC TRANSIT	Suburban Mobility for Regional Transportation (SMART)
ROADS	Michigan Department of Transportation (MDOT), Department of Public Services (Wayne County) and Department of Public Works (City of Detroit)

The chart lists the current public and private service providers found within the city of Detroit.