

# Funding Municipal Infrastructure: Integrating Project Finance and Crowdfunding

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Abstract: Rapid urbanization within the United States has increased stress on municipal infrastructure systems. Understanding the underlying issues provides a new perspective for implementing innovative infrastructure financing strategies. Increased deployment of project financing has been used for large infrastructure projects and there is potential to scale these strategies for municipal infrastructure assets. Likewise, crowdfunding has unleashed new tools for engaging constituents in infrastructure development. Combining crowdfunding and project finance provides municipalities with a new option for launching community infrastructure projects. This paper explores the motivation and considerations for bringing together crowdfunding and project finance.

Key words: crowdfunding, project finance, infrastructure, municipal financing, urbanization

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## I Introduction: Municipal Infrastructure Financing

United States municipalities lack the fiscal resources to preserve and maintain, as well as construct new infrastructure projects. With limited federal funding it is becoming increasingly important for cities to become more self-sufficient in regards to infrastructure services. Federal agencies have created innovative infrastructure financing solutions, but this issues mainly apply to large scale infrastructure and seldom help cities address small scale infrastructure development. Among these federal solutions, project finance has become a favored method for providing design, construction, finance, operations, and maintenance services for large infrastructure projects. While federal programs have incentivized large scale innovative finance, start-up companies have harnessed small scale investing through crowdfunding platforms to address innovation and funding issues for small and medium sized entrepreneurial ventures. Embracing project finance and crowdfunding provides new opportunities to fund infrastructure projects and address funding, quality, and innovation issues. This paper looks at the opportunity to bring together crowdfunding and project finance in the United States market to address infrastructure issues.

## II Framing the Problem: Infrastructure Crisis & Municipal Fiscal Stress

The American Society of Civil Engineer's 2013 Infrastructure Report Card evaluated 16 infrastructure areas and assigned a composite grade of D+. The ASCE estimated that a total investment of \$3.6 trillion is needed by 2020<sup>1</sup> to repair and provide adequate infrastructure services. This same sentiment has been reflected in reports published by the United States Governmental Accountability Office and Congressional Budget Office, as well as independent consulting firms such as Ernst and Young and the Brookings Institute.

The infrastructure crisis is a complex issue that revolves around the intersection of policy, economics, engineering, and finance. As experts and researchers continue to debate solutions for repairing and providing adequate infrastructure, cities around the country are left vulnerable to the consequences of failing road, energy, and water systems. In a supplementary report to the 2013 Infrastructure Report Card, ASCE captured the economic implications of not addressing the infrastructure crisis<sup>2</sup>:

- \$1.3 trillion loss in GDP
- \$3,100 per year drop in personal disposable income per household
- 3.5 million job loss
- \$1.2 trillion increase for businesses
- \$611 billion for households

Infrastructure delivery is heavily dependent upon the commitment of federal and local funds. And, local and federal economies are dependent upon a healthy infrastructure system. This vicious cycle has perpetuated a system that has allowed cities to decline in terms of infrastructure support. Despite the increasing federal attention on infrastructure policy, local initiatives have the most power to influence change. The National League of Cities published a 2014 report detailing this exact issue. The report included ten challenges facing United States cities, of which “fragile fiscal health” and “deteriorating transportation infrastructure” were the first and second priorities<sup>3</sup>.

Providing adequate and sufficient infrastructure continues to be an issue of funding and management. Looking at these issues through three distinct perspectives (municipal budgeting, federal policy stagnation, and decreased constituent engagement) offers a unique foundation for creating innovative solutions.

### Municipal Budgeting

Currently, cities are home to more than 80% of the American population and contribute to more than 75% of the nation's economy<sup>4</sup>. Despite this, cities and metropolitan areas remain heavily reliant on federal and state financing to implement capital projects.

Even though most infrastructure systems are located at the urban level, cities are currently not well positioned to take on all the risks of infrastructure financing. In December 2010, the Congressional Budget Office released a report addressing local government fiscal stress<sup>5</sup>. Since the 2008 housing market crash and subsequent economic recession, cities and municipalities have been hard-pressed to find funds to deliver much needed services to constituents. In general 25% of local government revenues come from property taxes<sup>6</sup>. Therefore, falling housing prices directly affect the amount of funding available for infrastructure services. Moreover, during economic downturns, city expenditures often escalate due to increased police enforcement needed to address elevated crime rates, need to provide more public transit options, and higher need for job training and social welfare programs as unemployment increases. In effect, local governments postpone investment projects and redirect funds to address these urgent quality of life concerns<sup>7</sup>. Many times these "tabled" investment projects are infrastructure maintenance projects that will not have short term catastrophic effects. As cities continue to direct monies away from infrastructure, negative economic impacts increase substantially.

### Federal Stalemate

For the past several years, political polarization has increasingly been a problem for infrastructure development. Research shows that the 112<sup>th</sup> United States Congress, in 2012, was the least productive in American history, enacting only 2% of all bills presented<sup>8</sup>. Although more recent statistics show that Congress has been more productive, repetitive failure to pass long-term funding bills for infrastructure has impacted rehabilitation and new construction. This can be most clearly seen with transportation funding. In recent years, the federal transportation funding stream has become insolvent and inconsistent. Without an increase to the federal gas tax (the primary financing mechanism for the Highway Trust Fund) since 1993, transportation spending continues to exceed the available funding reserves. For this reason, the United States General Fund has had to supplement the HTF since 2008. In October 2014, the 2012 short term funding bill expired without plans to extend the funding cycle or repairing the inherent difficulties with the HTF. Therefore, the federal political stalemate has stunted United States in infrastructure investment. The short term funding act, approved in 2012 expired in October 2014 without a concrete plan for extending the funding cycle or repairing the inherent difficulties with the HTF. In closure, Congress decided to fund another short term extension to ensure that upcoming transportation services were funded and more time was allocated towards creating a solution. And, whereas European nations spend 5% GDP and China spends 9% GDP on infrastructure, the United States only invests 2.4% GDP.<sup>9</sup>

State and local governments have tried to supplement declining federal aid by proposing more specific and frequent infrastructure funding bills. Despite the steady increase in infrastructure ballot measures at the local and regional level, voter turnout and constituent engagement has been low<sup>10</sup>. This has especially been the case for general election ballot measures, as compared to initiatives proposed during primary election cycles. Without widespread voter participation, it has become increasingly difficult to gain support for infrastructure initiatives.

### Lack of Civic Engagement

Lack of state and governmental action to address infrastructure issues has led to a decline in constituent engagement. This problem of disengagement stems from a lack of trust in government. And, because there is limited constituent engagement in politics, there is less pressure on politicians to move forward with infrastructure solutions. This perpetual cycle of inaction and prevents creation and implementation of funding and policy solutions.

The Pew Research Center has published reports regarding the levels of trust in government between 1958 and 2014. In 2014 public trust in government was at 24%, as compared to previous years: 31% in 2005, 17% in 2008 and 22% in 2010<sup>11</sup>. Even as trust and civic participation remain low, it has become increasingly important to involve citizens in decision making processes to insure projects are appropriately prioritized and address citizen concerns. As a result, apathetic constituents have the potential to become a risk for infrastructure issues. Without the support of the constituent base, it is difficult for projects to gain support and move forward. When projects such as California High Speed Rail move forward with limited public support, there is increased social risk. This level of public dissatisfaction may stall project construction and prevent future projects from taking off.

## III Potential Solution: Project Finance & Crowdfunding

These three perspectives highlight the disconnect between funding availability, political will, and community engagement. Without understanding the relationships between people, policy, and financing, it is difficult to address infrastructure rehabilitation and new construction. Instead of considering disparate solutions in policy, community engagement, and finance, decision makers must overlap these perspectives to generate innovative solutions. Consequently, innovative financing measures, including public-private partnerships and expansion of municipal bond initiatives, have the potential to reconnect people and policy while also providing funds for infrastructure projects. Once other innovative solutions are developed, they must be tailored for specific projects and communities to ensure sustainable implementation.

### Project Finance

As an innovative financing method, project finance has been successful for its ability to transfer risks away from municipal governments, who (as we have seen) are vulnerable to property tax fluctuations and federal funding availability, and into the hands of private sector. As responsibility and risk is transferred to the private sector, it is easier to implement strategies that provide efficient cost and scheduling for the project. Other characteristics of project finance deals include:

- Capital intensive: median project size is approximately \$139 million and average size is \$435 million<sup>12</sup>

- Highly leveraged: projects usually have a high debt to equity ratio, such as 60/40
- Long term: investors are looking for a long-term investment that is greater than 20 years and insures a stable return
- Allocated risk: project parties are capable of handling various types of risks and establish a structure that allocates risks according to those strengths
- Revenue source: to insure that debt and equity facilities can be repaid, the project must have a steady and/or trusted revenue source, such as a user fee or availability payments

Currently, project finance is reserved for projects that have large capital expenditures because subsequent transaction costs can be easily absorbed into total project costs. In contrast, the cost margin required to finance smaller infrastructure projects is much smaller (decreasing the benefit-to-cost ratio of transaction costs). Therefore, there is a point at which it is not conducive to pay for the additional cost of financing. Regardless, the current financial and political conditions create a niche environment for project finance strategies to be adopted at a municipal level, specific to infrastructure development. Unlike large financial institutions that regularly handle the complexities of project finance, smaller investment bodies are well positioned to manage smaller projects with limited risks. Furthermore, properly scaling project finance strategies for municipalities requires financial managers to understand the environment in which the project is taking place. This could manifest itself in many ways; but, in order to gain widespread project and financial support to utilize project finance strategies, owners must engage the crowd.

### Crowdfunding

Crowdfunding is an untapped method for addressing issues of deteriorating infrastructure systems. As the banking sector has become more risk averse and traditional financing has dwindled, small to medium sized companies have turned to crowdfunding platforms as funding sources. In their research article, “Alternative Types of Entrepreneurial Finance”, Schwenbacher and Larralde<sup>13</sup> discuss increased crowdfunding utilization as a result of lack of resources, aversion to risk, for-profit ventures need to balance quantity and quality, lack of customer preference knowledge, seed funding, legal issues, and need for crowd wisdom. For these reasons, the crowdfunding market is continuing to expand. Between 2010 and 2011, the crowdfunding market grew 54% and from 2011 to 2012 the crowdfunding market grew another 6%<sup>14</sup>.

Crowdfunding is the cross section between microfinance and crowdsourcing. Since 2012, crowdfunding has become a more viable funding source as Kickstarter and other crowdfunding platforms gained momentum. Microfinance began as a way to provide low income individuals with low interest loans, and is now being utilized as a strategy for financing small initiatives. On the other hand, crowdsourcing “harnesses the creative solutions of a distributed network of individuals through what amounts to an open call for proposals”<sup>15</sup>. Together, these two ideas can engage a large base of financiers to empower small initiatives and ventures.

Crowdfunding models vary greatly and offer different opportunities for specific projects. Whereas platforms such as Kickstarter and Indiegogo service a broad range of crowdfunding projects, a new phase of crowdfunding platforms focus strictly on civic crowdfunding. These platforms (ioby, Citizeninvestor, Spacehive, neighbor.ly) focus on civic crowdfunding initiatives, described as public goods, club goods, and common pool resources<sup>16</sup>. Civic crowdfunding expert, Rodrigo Davies,

analyzed a broad range of civic crowdfunding initiatives including parks, facilities, gardens, transportation infrastructure, waste, etc. Not only are the missions of crowdfunding platforms different, their structures are varied. Some allow open posting, and others are restricted to government entities. Some provide flexible funding options, others enforce stringent funding requirements. Additionally, crowdfunding models encompass a diverse range of financing and funding techniques: patronage donations, reward based donations, pre-sales, traditional lending, social-lending (lending without interest), peer-to-peer lending (lower interest rate), peer-to-business lending, and equity crowdfunding (business angels)<sup>17</sup>.

Crowdfunding has huge potential to be used for municipal infrastructure projects. Since 2010, more than 1,200 civic crowdfunding campaigns have launched, raising more than \$10.5 million dollars. While there are projects that have raised nearly \$80,000, 80% of successful civic crowdfunding projects have raised under \$10,000<sup>16</sup>. Of the campaigns that were launched, 63% have been successful at reaching or exceeding their target amount. Research has shown that projects that meet their funding goal tend to be overly successful, quickly raising necessary funds or exceeding the target goal. Conversely, projects that are unsuccessful raise very little, if any, of the target goal amount. Additionally, successful projects do not depend solely on individual funders. There is usually a strong contingent of local businesses that will donate or invest in the project. For the case studies provided in the attachment, private investment ranges from 42% to 98% of the fundraising campaigns.

For the most part, the success of these projects depends upon timing and extent of citizen participation. To ensure crowdfunding initiatives are successful, experts have created a set of best practices, including comprehensive engagement plans to encourage communities to participate in the crowdfunding process and presence of a strong project sponsor or champion.

There are several stand-out projects that have successfully utilized crowdfunding best practices. These projects include the Arapahoe Protected Bike Lanes in Denver, The Hampline in Memphis, The Liverpool Flyover, and the Denver mini bond initiative. Each of these projects was executed in a unique fashion and the crowdfunding process was customized for each project. The attachment section provides four case study reviews that provide in-depth assessments of how crowdfunding can be used to address infrastructure development.

## IV Discussion: The Case for Crowdfunding

The financial benefits of using crowdfunding may not outweigh the costs, but the social and long-term benefits of implementing crowdfunding has the potential to increase the return on investment in a variety of ways. The insights in this section address the ability for crowdfunding, used alongside project finance, to create greater impact.

### Reducing Demand Risk

With demand risk becoming more prominent among public-private partnerships and other forms of project finance, crowdfunding has the potential to confirm demand projections and reduce demand risk. Crowdfunding began as a way for entrepreneurs to gain market access (and approval) prior to manufacturing. This seed capital helped spur the development process and predict product demand levels to prevent unsold units. A similar intent is reflected in crowdfunding infrastructure

development. Individuals who provide initial funding are in some ways “voting with their dollar”, similar to how a traditional consumer would support a product. Unlike traditional project finance, crowdfunding has a larger focus on localized financial support. Because the majority of funders are located within a close vicinity to the project, they have a vested interest in the project as future users.

### Increase Political Will

In a politically stagnant environment, crowdfunding has the potential to increase political will to support infrastructure development and subsequent project finance endeavors. Crowdfunding has an extensive reach because it is dependent upon community engagement and participation during early stages of infrastructure development. When many individuals are able to “vote with their dollar” and show widespread support for a particular project, politicians are more inclined to support the project and similar projects. Additionally, crowdfunding is a viable political engagement tool because it is an apolitical approach for solving infrastructure delivery issues. Conservatives are interested in reducing government involvement and dependency, whereas liberals are interested in grassroots activities to address civic issues. This universal approval of the crowdfunding process makes it easier for politicians to get involved and helps project sponsors use crowdfunding to leverage political support.

### Better Civic Decision Making

Crowdfunding can be used to engage and educate constituents throughout infrastructure development. Time and again, citizen participation has been used as a means to increase the sustainable civic decision making. A review of the Boston Southwest Corridor project in the 1970s and 1980s credits the success of the project to the value designers placed on citizen input<sup>18</sup>. The exchange of information and insights (between experts and locals) during the design process produced more sustainable solutions. Involving citizen input expands the knowledge base by tapping local knowledge. Local knowledge comprises experiential knowledge concerning specific events, characteristics, and relationships and understanding of local context and meaning. These life experiences serve as evidence and make nuanced information more explicit<sup>19</sup>. Not only does crowd input provide more information for the project team, collective decision making has merits for achieving sustainable infrastructure development. Surowiecki has researched cases of crowd wisdom and has found that decision making that involves collective knowledge has a higher probability of producing accurate answers<sup>20</sup>. With the advent of Web 2.0, there are more opportunities for information creation, analysis and dissemination<sup>21</sup>. This offers a new platform for public participation and better civic decision making.

### Provide Strategic Financing

Crowdfunding provides strategic options for financing infrastructure projects. The case studies in the attachment show a variety of these methods. In the case of the Hampline, crowdfunding was implemented as the final step to achieve the target funding goal. This strategy, last mile funding, is most successful for helping mature initiatives reach the implementation stage. Other cases have utilized crowdfunding to satisfy grant requirements. For example, the Arapahoe Bike Lane project in Denver used crowdfunding because a municipal grant required that matching funds were secured through non-grant means. The crowd became a body of investors and matched the City

of Denver's contribution to the project. The last type of strategic funding involves a form of seed funding for infrastructure development. For example, the Denver mini bonds program (a crowd investment initiative) provided initial funding for an infrastructure initiative, creating momentum for the remaining funds to be secured via larger private investors<sup>22</sup>. This type of initial investment is especially strategic because it offers an opportunity to test the success of a project prior to full project implementation and lower the barrier to entry for risk averse investors.

### Market Analysis

Many factors must be considered before integrating project finance and crowdfunding. Successfully integrating these methods for municipal infrastructure development, requires experts to complete a comprehensive project analysis to understand the nuances of project development and implementation. And, because crowdfunding and project finance are advantageous for very different reasons, this integrated method would need to consider additional project organization characteristics such as technical expertise, transaction fees, revenue streams, and potential project champions.

Currently, crowdfunding has been limited to a patronage model, where individuals are able to donate to specific projects without expectation of a financial return. For the most part, this model has been successful for attracting larger donors and political support for municipal projects; but, it is not necessarily sustainable. Projects that depend on the patronage model require a large community of contributors who have access to disposable income. For these reasons, the patronage model would be most applicable for smaller projects that require additional funding and have no revenue stream.

Conversely, project finance is a viable option when there is a consistent and project specific revenue stream. Depending upon the legal structure and partnership of the project finance deal, it is possible that patron based crowd involvement could supplement user fees or availability payments. A more sustainable alternative to the patronage model, is to implement a peer-to-business lending model (similar to the Denver mini bond initiative). In this case, the crowd becomes a conglomerate of investors, and can reap the benefits of being an equity or debt partner throughout project implementation. It is important to note that project characteristics and the community profile will dictate which strategy is most appropriate.

The variety of crowdfunding models is able to accommodate multiple types of design and construction problems. The case studies show that crowdfunding has been successful for funding general infrastructure funds, preliminary and final project design, and limited scope infrastructure construction. With the introduction of project finance, with its focus on integrated design and construction, crowdfunding could be used as a supplemental funding mechanism during any phase (depending upon the crowdfunding contingencies and requirements).

In addition to understanding the project characteristics, the success of crowdfunded projects hinges on the project champion's ability to engage the community through events, business partnerships, and social networking. Crowdfunding platforms, such as Citizinvestor, ioby, and Kickstarter, have acknowledged this and provide tools for project champions and sponsors to creatively attract patrons. Furthermore, these project champions are able to educate the crowd, within geographic

proximity, about the social impact information and increase the probability of funding<sup>23</sup>. Therefore, projects that are looking to utilize crowdfunding strategies must ensure there is a strong community liaison and/or sponsoring organization. In many cases, this support comes from a group of community businesses that are able to supplement individual funding to achieve the project's target fundraising goal.

### Considerations

While there are advantages for pursuing this integrated financing strategy, there are also inherent obstacles to ensuring diverse community engagement to reach crowdfunding potential. Online crowdfunding platforms are prohibitory to numerous demographics. Online crowd engagement caters mostly to white, middle- or upper-class, English speaking, higher educated individuals with access to high-speed connection<sup>24</sup>. And, in reflection, this corresponds with the typical demographic most likely to participate in community engagement activities.

Using crowdfunding as a means to gather information for infrastructure development and better inform decision makers about community projects falls within the realm of political and behavioral science. The corresponding literature discusses this type of participation in terms of social capital. Uslaner and Brown conducted in-depth studies of the relationship between inequality, trust and civic engagement. They found an indirect relationship between the level of inequality and level of trust (i.e. as inequality increases, trust decreases)<sup>25</sup>. This is not surprising given the sociology behind social capital: individuals who share like experiences, characteristics, etc. are more likely to trust each other and are more empowered to help their community of peers. Individuals who have more resources, and therefore more access to decision makers, use their social capital as a means of engaging in civic activities to increase and protect their resources. Further, Uslaner and Brown state "Economic inequality leads to less trust ... high levels of inequality lead to less optimism for the future (and sense of control)... and where there is a lot of inequality, people in different economic strata will be less likely to have a sense of shared fate"<sup>25</sup>. This issue of equity is important to consider when understanding the community that is being impacted and engaged in crowdfunding activities. Because infrastructure is a public good, these considerations weigh more during the project planning and development phases, and strategies to engage minority constituents must be assessed and implemented.

## IV Conclusion: Looking Forward & Implementation

Although crowdfunding is a relatively new form of finance, the opportunity to expand crowdfunding beyond its nascent state (as a donation based financial vehicle) to a citizen investment tool has increased exponentially with new policies and research.

### Policy Implementation

The United States 2012 JOBS Act<sup>26</sup> allows individual enterprises/initiatives to seek funds from the crowd. With this policy change, Deloitte estimated that the 2014 crowdfunding market would grow to \$3 billion<sup>27</sup>. The JOBS Act allows individuals to participate in equity partnerships with small financial endeavors, mainly those perpetuated through crowdfunding platforms.

In January 2015, President Obama came forward with a \$302 billion proposal to increase infrastructure investments by at least 35%<sup>28</sup>. This proposal, known as the Grow America Act,

continues in the same vein as the July 2014 Build America Investment initiative. The Grow America Act helps federal agencies find new ways to invest in infrastructure. As a result, the EPA established a new center for investing in drinking water/wastewater systems and expanding public-private partnership resources. To expand the current infrastructure investment strategies, this 2015 proposal mentions Qualified Public Infrastructure Bonds (QPIBs). Influenced by increasing engagement of micro financiers, QPIBs can be used for government owned assets with long-term leases/concessions with private parties. QPIBs are a cross between traditional governmental bonds and private-activity bonds (PABs) and have been implemented to spur private investment in infrastructure. QPIBs have several conditions that make them more attractive than PABs: no expiration date, no cap on issuance (PABs are limited to \$15 billion), no Alternative Minimum Tax<sup>29</sup>. While PABs have been successful at financing over \$10 billion in road, tunnel, and bridge construction, QPIBs can be directed towards a wider array of infrastructure projects including airports, ports, mass transit, solid waste disposal, sewer, water, and surface transportation<sup>29</sup>.

### Further Research

While current policies are making it possible for smaller investors to be a part of infrastructure development, there is still greater potential to engage constituents throughout the infrastructure delivery process, not just through finance. Since individuals are now invested financially, there is a higher probability that they will demand more accountability for infrastructure services. For the most part, historical infrastructure funding has failed to address quality and sustainability issues. Involving the user base throughout the infrastructure delivery process via crowdsourcing and crowdfunding initiatives, provides additional power to hold those municipalities and other infrastructure owners accountable to continued maintenance and operations.

With the growing concern for infrastructure investment, it has become imperative for cities to consider innovative financing strategies. The disconnect between policy, community, and available funding creates the perfect environment for introducing a new tool for addressing infrastructure delivery issues. While project finance has been a successful method for large scale infrastructure investment, crowdfunding has been a successful method for small to medium sized ventures. Integrating these two methods produces has the potential to provide long-term, sustained infrastructure development.

The next step of this research will be to explore how communities around the world are using civic engagement, collective action, and other crowd strategies to increase the momentum for infrastructure projects. Social media has created a new platform for individuals and groups to communicate and organize around causes. Capturing this collective energy and implementing policies, strategies, and tools to help transform fleeting movements into sustainable change will help achieve long term solutions for infrastructure development. Over the next few months, I will be researching case studies of municipal infrastructure finance, especially those with large amounts of civic engagement. I am looking forward to presenting crowdfunding insights, as well as collective funding insights, at this conference.

## V Attachment: Case Studies

### Denver's Mini Bonds Initiative

Location	Denver, Colorado
Type	General Infrastructure Fund
Funded	\$12 million
Time Frame	October 28, 2014-December 12, 2014
Sponsoring Organization	City of Denver
Type of Funding	Seed Financing
Procurement Strategy	Traditional DBB, Public Owned
Platform	City Website
Crowdinvestors	Aprx. 1,000
Private Investment	\$538 million (98% of total \$550 million needed)

Within one hour of opening online sales for individual investors, \$12 million worth of Denver, Colorado's mini bonds had sold. In fact, sales were so successful that the city had to refund 375 orders<sup>30</sup>. Prior to this mini bond offering, Denver was behind on annual infrastructure maintenance by \$25 million. This funding gap triggered a yearly ballot measure to help fund projects. As banking and financial regulations became more stringent for buying and selling municipal bonds, Denver decided to move into the municipal bond space and offer a new type of bond to attract investors, quell potential funding questions, and meet infrastructure demands. The program that these bonds will finance is the Better Denver initiative that has earmarked incoming dollars for recreational and cultural facilities, including the \$5.4 McNichols Building restoration in Civic Center Park, \$3.6 million Boettcher Concert Hall renovations, and \$3 million Central Denver Recreation Center construction<sup>31</sup>.



Municipal bonds have traditionally been sold for \$20,000, but Denver decided to sell mini-bonds for \$500 each. A nine year bond with a 50% maturity rate would yield \$750 (4.26% return), and a fourteen year bond with a 100% maturity rate would yield \$1,000 (4.8% return)<sup>32</sup>. Moody's reviewed the General Obligation Denver Bonds, Series 2014A, and presented a AAA rating naming bonding strengths such as "regional tax base, sound financial management practices, low lease burden, [and] manageable pension burden supported by dedicated tax levies"<sup>33</sup>. These bonds were limited to Colorado residents and were unable to be resold on other financial markets, keeping the business local to the project. This was not the first time that Denver had pursued this kind of crowdfunding venture- it was actually the fifth time with the first mini-bond round occurring three years ago. Although the city is paying more interest on these mini-bonds than traditional bonds, the goal was to involve more residents involved in infrastructure development by providing returns

at three times the typical bank rate (1.5%)<sup>32</sup>. The remaining \$538 million in bonds was sold through traditional markets.

In total, the initiative will fund over 300 projects that have been previously approved by voters. Whereas other cities have used similar mechanisms to raise funds, the Better Denver program is specific to public-focused assets. This program has been especially successful because of local publicity and new financial policies that are forcing cities to think differently about traditional municipal bonds. For example, recent financial policies are making it more and more difficult for banks to buy and sell municipal bonds. FDIC regulations are requiring big banks to keep a set amount of “high quality liquid collateral assets”<sup>34</sup>. This means that banks are moving away from municipal bonds in favor of more liquid assets.

### Arapahoe Protected Bike Lanes

<b>Location</b>	Denver, Colorado
<b>Type</b>	Bike Lane Design
<b>Funded</b>	\$35,000 (raised \$36,085)
<b>Time Frame</b>	October 28, 2014-December 12, 2014
<b>Sponsoring Organization</b>	Downtown Denver Partnership
<b>Champion</b>	Aylene McCallum
<b>Type of Funding</b>	Matching, Last Mile
<b>Procurement Strategy</b>	Traditional DBB, Public Owned
<b>Platform</b>	Ioby
<b>Crowdfunders</b>	Aprx. 250
<b>Private Investment</b>	\$120,000 (77% of total \$155,000 needed)

Prior to the Arapahoe crowdfunding initiative, the Downtown Denver Partnership (DDP) and City & County of Denver were in talks regarding the execution of the 2007 Downtown Area Plan to create bike facilities and develop the downtown area. The Plan was the result of extensive outreach to the community and design professionals. And, the Arapahoe Protected Bike Lane was among the proposed projects as an integral part of the Denver Moves bike plan, an initiative working to create a more livable Denver. As part of the Downtown Area Plan, the Protected Bike Lanes network is being designed and constructed in phases to adjust to the 42% increase in bike commuting in the city from 2012 (4.2% to 6.6%)<sup>35</sup> and implementing safety features to address a survey that showed 60% of cyclists were concerned about their safety biking alongside daily traffic<sup>36</sup>. Unique design aspects of the Arapahoe Protected Bike Lane project include the use of parked cars, instead of poles, as the traffic barrier between cyclists and traffic.



Figure 1: Arapahoe Protected Bike Lanes<sup>36</sup>

DDP is responsible for planning, managing, and developing the downtown Denver area. With support from the City & County of Denver, DDP decided to champion the design phase of the Arapahoe Protected Bike Lane Project. DDP successfully secured \$120,000 from the Gates Family Foundation and the Downtown Denver Business Improvement District<sup>35</sup>. Whereas the Gates Family Foundation contribution did not have explicit financial stipulations, the City & County of Denver pledged to cover construction costs and \$35,000 of the design fees if the private sector could

secure the remaining \$35,000. Taking note from Memphis’ success with crowdfunding, Aylene McCallum, senior manager for transportation and research at DDP, decided to go to the crowd for the final stretch of funding<sup>37</sup>.

DDP saw crowdfunding as an opportunity to allow community members and businesses to make a statement about what matters to them and to have the chance to “vote with their dollars.” The ultimate goal of this campaign was to gain community buy-in. With approximately 250 community and small business contributions, the project achieved its established goal. Despite the intent to increase community engagement in infrastructure development, DDP was very open about their plans regarding failed funding. Using ioby’s crowdfunding platform, DDP collected donations at the end of the campaign and had other funding plans in case the crowd was unable to reach the \$35,000 goal. If the goal amount was exceeded, the funding would go to more complex bike lane designs.

### The Hampline

Location	Memphis, Tennessee
Type	Bike Lane Construction
Cost	\$67,150,12 (raised \$68,642.79)
Time Frame	October 28, 2014-December 12, 2014
Sponsoring Organization	Livable Memphis
Champion	Pat Brown
Type of Funding	Last Mile
Procurement Strategy	Traditional DBB, Public Owned
Platform	Ioby
Crowdfunders	Aprx. 500

The Hampline has been lauded for its success in civic engagement in a particularly depressed area. This project was the first crowdfunded bike lane in the country. During the project funding phase in 2013, Memphis, Tennessee was the poorest major metropolitan area in the United States. Between 1970 and 2010, Memphis' population grew by only 4% while the geographic metro area grew by 55%<sup>38</sup>. These numbers paint the picture of an empty urban core, with 50,000 vacant lots, and a growing suburban population. To help bring more activity to the downtown area, private foundations and for-profit retailers in the downtown area pushed for delivery of the Hampline and initiated the funding process. Pat Brown, a local art store marketer, used her past business expertise as a bank executive to motivate the funding process. The project's total price tag was \$4.5 million and when the project reached its last \$75,000 to be fundraised, Liveable Memphis (the sponsoring organization), turned to the crowd<sup>39</sup>.

The Hampline is part of a larger movement towards enhancing bike infrastructure in Memphis (71 miles of bike infrastructure, over 130 lane miles, have been added since 2010<sup>40</sup>). After being ranked one of the worst cities for bicycling, the metropolitan planning organization planned to take a 25 year approach with the Livability 2040 Regional Transportation Plan to help guide projects. As a result, the Hampline was a concerted effort to connect Binghampton, a low income neighborhood, to the downtown area and the current network of bike lanes. Prior to project implementation, Binghampton was secluded because there was no direct bike connection into the neighborhood, despite the fact that Broad Avenue leads from a business avenue to the Binghampton community. In a push to gain support for the project, there was a two-day event in Binghampton to engage residents in tactical urbanism activities.



Figure 2: The Hampline<sup>38</sup>

the bike rack will be accompanied by a bike repair station with self-service tools and air<sup>38</sup>. Even though the design was completed by Wade Walker of Alta Planning and Design and approved by Joe Gilpin of NACTO Urban Bikeway Design Guide, Liveable Memphis used crowdfunding as a means to vet the project and design plans<sup>39</sup>.

The design included two-way bike lanes protected with planted medians, bike signals, and green paint. The Hampline extends from Shelby Farms Greenline and provides safe access to five schools within the neighborhood, Tillman MPD Precinct Station, Howze Park, Lester Community Center, Benjamin Hooks Public Library<sup>38</sup>. The total budget is expected to cover the construction and engineering/design fees. If the project is successful, donor names will be inscribed on a plaque, and if the target amount is exceeded by \$1,000 a bike rack will be installed at Lester Community Center. If the funding amount is exceeded by \$3,500

## Liverpool Flyover

<b>Location</b>	Liverpool, Great Britain
<b>Type</b>	Urban Park, Design and Planning Phase
<b>Funded</b>	£40,844 (£43,724 funded)
<b>Time Frame</b>	November 18,2013-April 15, 2014
<b>Sponsoring Organization</b>	We Found Liverpool, Friends of The Flyover
<b>Champion</b>	Steve Threlfall, Kate Stewart, Mark Bennett
<b>Type of Funding</b>	Last Mile
<b>Procurement Strategy</b>	Traditional DBB, Public Owned
<b>Platform</b>	Spacehive
<b>Crowdfunders</b>	337
<b>Private Donations</b>	42% of total funded

The Liverpool Flyover became an idea shortly after Liverpool’s 2012 Strategic Investment Framework was made public. The Plan’s mission to enhance Liverpool through “Enterprise, People, and Place”, included demolition of Churchill Way. The Churchill Way flyover extends from Islington to Dale Street and Tithebarn and passes by the World Museum, Walker Art Gallery, Central Library and St. Georges Hall<sup>42</sup>. The costs to demolish the two roads and two pedestrian routes would amount to more than £3 million<sup>41</sup>. The Liverpool City Council was considering decommissioning the Churchill Way flyover to provide additional public spaces for the city and reconnect existing residential communities. The Strategic Investment Framework laid out provisions for safe pedestrian and cyclist mobility in the city<sup>42</sup>.

In response to the plans to demolish the Churchill Way flyover, a social enterprise, We Make Liverpool, took action to save the flyover and provide public space at the same time. Through a series of public presentations with councilors, council staff, museums, businesses, and locals, We Make Liverpool found broad support for a new type of public space, the Liverpool Flyover. Once the Liverpool Council was convinced of the project’s legitimacy and support, they required We Make Liverpool to finish fundraising by April 15, 2014 before agreeing to fund the construction of the Flyover<sup>43</sup>. Starting November 18, 2013, We Make Liverpool launched the campaign Friends of The Flyover to engage Liverpool residents in raising funds for the Liverpool Flyover via an online civic crowdfunding site, Spacehive. The crowdfunding campaign was strategic in twofold. If the project was successful, there would be widespread support from the community for moving forward and the project would be validated as a worthwhile endeavor for the city.

The new project would provide 200,000 individuals with a new area for pedestrian/cyclist activity, event programming, outreach and education<sup>41</sup>. New construction would also provide new opportunities for local businesses to use the space to expand their services. Additionally, preliminary analysis showed future construction fees would cost less than the costs to demolish Churchill Way. The preliminary plans for the Flyover make use of low-cost materials to capitalize on the current structure



Figure 3: The Liverpool Flyover<sup>41</sup>

and achieve a lower budget. The design would include a promenade for pedestrians and cyclists, plantings, kiosks, cafes, and lighting/power infrastructure. Part of the design details includes potential solar and wind energy implementation.

The project was successful at reaching its target goal of £40,844 and exceeding it by £2,880. The project total cost will cover the feasibility plan, specifically the design, surveying, and planning phases of the project. More than half of the amount was funded by individuals, whereas the other 50% was raised by four private partners via in-kind and monetary donations<sup>41</sup>. With successful completion of the funding phase, the project has moved forward with the design phase. As part of this process, the Friends of the Flyover has capitalized on the crowd's engagement and started outreach to gather ideas regarding the final design.

## VI Biography

Kate Gasparro is a National Science Foundation Graduate Research Fellow studying Sustainable Design and Construction at Stanford University. Kate has spent the past four years bridging the fields of civil engineering and public policy through extensive academic studies, and has published work on the use of public-private partnerships to address failing transportation infrastructure. In addition to her work in the United States, Kate spent the past three years fostering a collaborative relationship between Engineers Without Borders and a rural community in Nicaragua to address water sanitation and delivery issues. Currently, she is currently working on a development project in Juarez, Mexico as part of an international research initiative. Recently, Kate was recognized as a Rhodes and Truman Scholarship finalist for her innovative vision and work to address community growth through infrastructure delivery. Kate is hoping to pursue a career in international infrastructure policy and delivery.

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