A New Approach to Public Engagement:
Capturing Better Ideas and Representative Priorities from the Public for the Illinois Department of Transportation

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Executive Summary

Introduction

In recent years, the Illinois Department of Transportation (IDOT) has devoted time and resources to improving its public engagement program and the quantity and quality of the feedback and ideas it receives from residents of Illinois. In 2016, as part of these ongoing efforts, IDOT commissioned the Institute for Policy and Civic Engagement (IPCE) and the Urban Transportation Center (UTC), both of the University of Illinois at Chicago, to study effective public engagement strategies for statewide Departments of Transportation and create the report: *Recommendations to Enhance Quality Engagement*.[1]

Building on the 2016 report, IPCE conducted a statewide engagement process for IDOT in early 2017. This engagement process utilized an innovative online approach to supplement IDOT's traditional public engagement methods. The unique strength of this multi-phased process was its ability to capture high quality ideas from the public and statistically representative public priorities – it was both open and representative. The findings of this report will inform the development of IDOT's 2017 Long-Range Transportation Plan (LRTP).

Methodology

IPCE's public engagement process consisted of two phases. Both phases included pairwise comparisons, a process by which residents were able to choose between two ideas or select an "I can't decide option" in response to the prompt: "Which idea do you think is more important for transportation in Illinois?"

Phase 1: public idea generation. This phase consisted of a pairwise comparison wiki survey, hosted by All Our Ideas,[2] which allowed the public to submit an original idea to be included in the bank of ideas. All residents of Illinois were able to participate in this phase and the link to the survey was publicized by IDOT. By the end of Phase 1, the public cast 36,353 votes on 185 competing ideas. Of those 185 ideas, 121 were submitted by the public.

Phase 2: representative public prioritization. This phase repeated the pairwise comparison process using 134 of the ideas generated in Phase 1, but used representative sampling techniques to identify two groups of 500 Illinois residents - 500 in IDOT Region 1 and 500 outside of IDOT Region 1. In this phase, respondents also indicated the percentage of IDOT's budget they would invest in competing transportation goals and modes. IPCE partnered with YouGov for this phase of data collection due to their unique, empirically proven method of capturing representative public input.

[1] Institute for Policy and Civic Engagement, "Recommendations to the Illinois Department of Transportation to Enhance Quality Public Engagement," June 2016. https://utc.uic.edu/research/recommendations-to-the-illinois-department-of-transportation-to-enhance-quality-public-engagement/. Accessed July 30, 2017.

[2] https://www.allourideas.org/IDOTideas/results

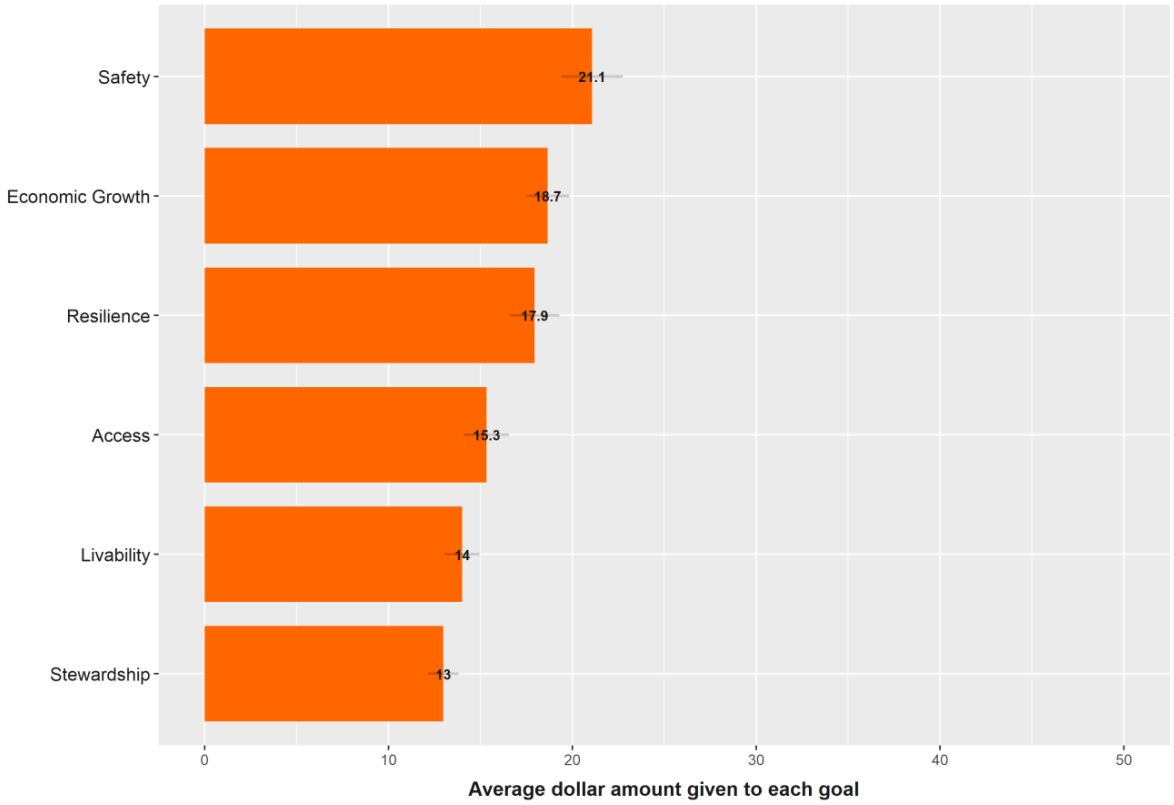
This multi-phased process allowed for input from a wide range of the involved public in phase 1, which informed the design of the Phase 2 survey. Given that a representative sample of Illinois residents took the Phase 2 survey, findings are generalizable to the entire state.

Section 1: Public Prioritization of IDOT Goals

Illinois residents were asked to complete a budget allocation exercise related to IDOT's six overarching goals for the 2017 LRTP: safety, economic growth, access, livability, stewardship and resilience. When asked to distribute $100 across the goal areas (Figure 4), residents prioritize safety ($21) as most important based on the average amount given to that goal area. Economic growth ($19) and resilience ($18) follow next. In Region 1, safety is prioritized more than economic growth, while for residents outside Region 1, safety and economic growth are more equally prioritized. Moreover, Region 1 residents place greater priority on access compared to residents living outside Region 1, but place comparatively less priority on stewardship.

Fig. 4: The Illinois Public's Transportation Priorities

Given $100, the average amount the public gives to each goal based on perceived importance. Grey bars represent confidence intervals.



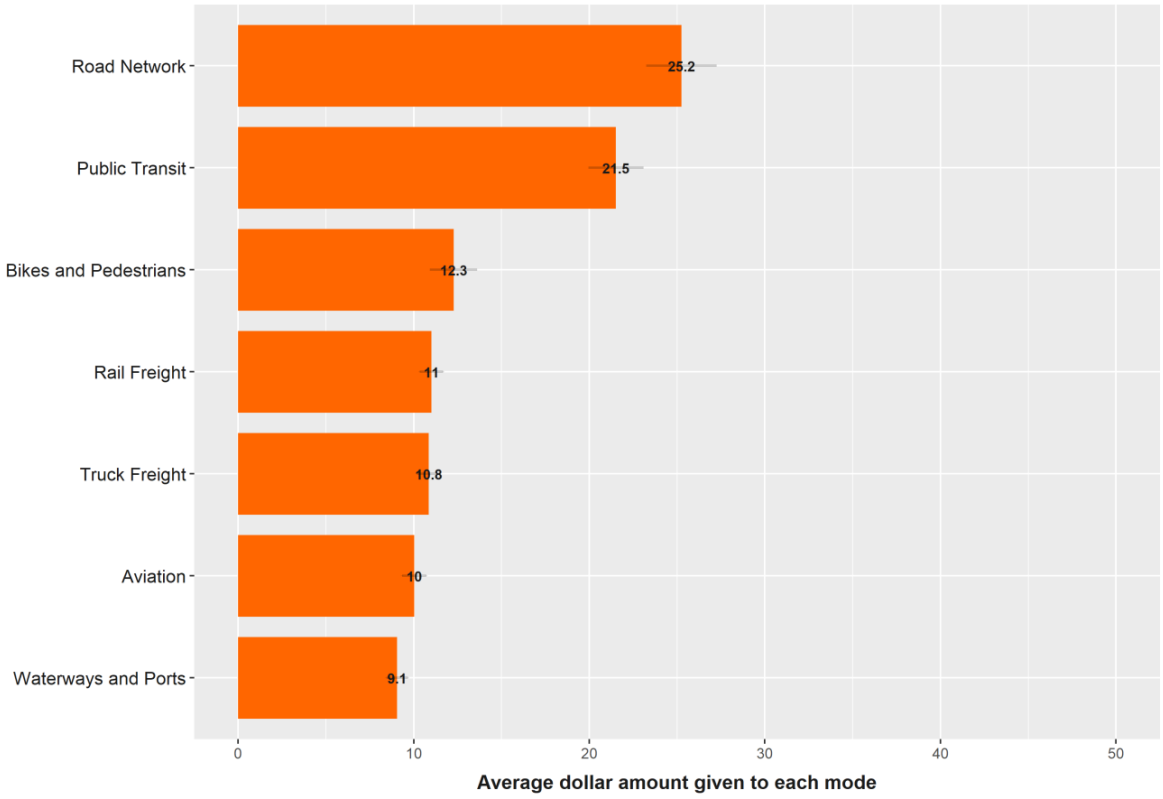
Section 2: Public Prioritization of IDOT Modes

With regard to the budget allocation exercise related to transportation modes (Figure 10), the public overwhelmingly prioritizes the road network ($25) and public transit ($22) as most important. For Region 1 residents, public transit is of higher priority, while for residents outside Region 1, the road network is a higher priority. The bikes and pedestrians mode is the third

highest priority for Region 1; however, for residents outside Region 1, the bikes and pedestrians mode is a lower priority and instead truck freight and rail freight are of next highest priority.

Fig. 10: The Illinois Public's Transportation Priorities

Given $100, the average amount the public gives to each mode based on perceived importance. Grey bars represent confidence intervals.



Section 3: Public Prioritization of Transportation Ideas

This section includes an analysis of the 134 ideas included in and voted on in the Phase 2 pairwise comparisons. Each idea was included in roughly 200 head-to-head match-ups. Ideas related to road networks and repairs were most frequently in the top 10 highest-ranked ideas for all residents statewide (Table 7) as well as for residents from both regions. This was true for both IDOT seed ideas and ideas submitted by the public.

Table 7[3]

Top 10 Ideas	Final Score All Illinois Residents	Final Score REGION 1	Final Score OUTSIDE REGION 1	Public Idea?
Increase road repairs that are in desperate need of repair now before creating new highway accesses	85	83.3	88	Yes
Invest in streets that enable safe and comfortable travel for users of all abilities and for all modes of transportation	84.6	86	80.8	No

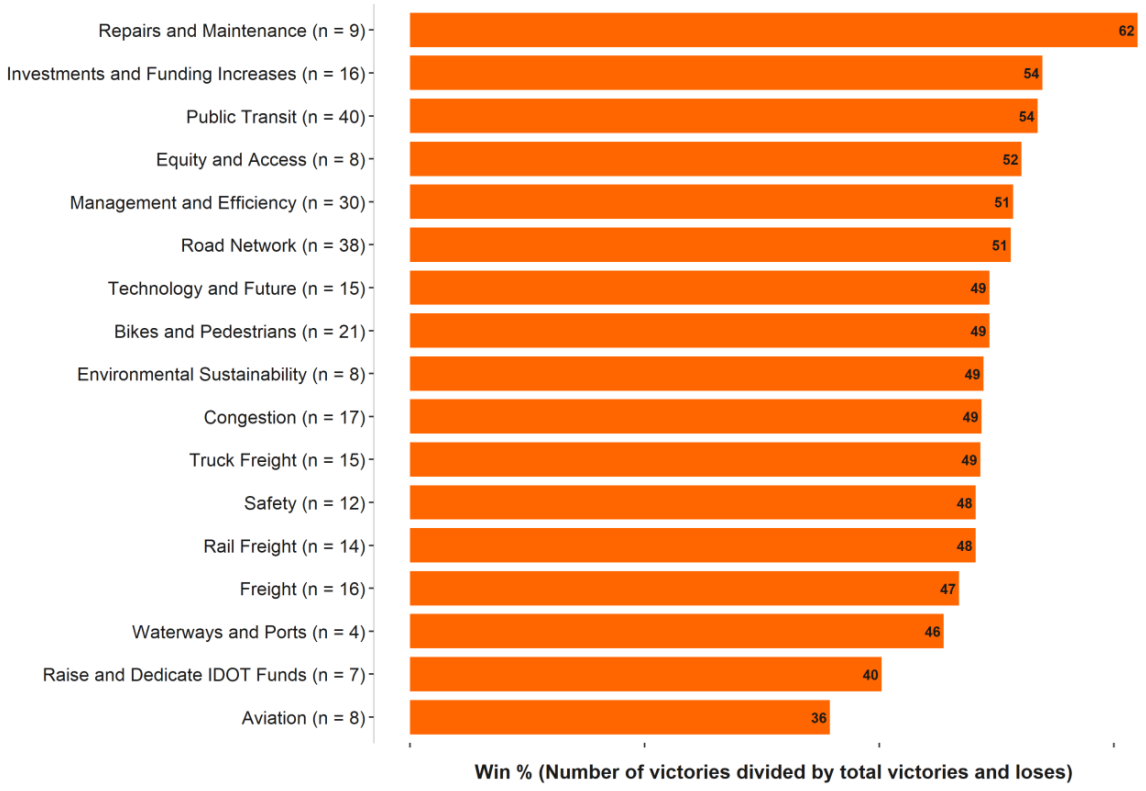
[3] See Appendix II for the full list of ideas

Increase the standards that roads are built with to ensure they last	83.1	87.2	76	Yes
Invest in long-term material solutions - not patching and short-term asphalt	79.2	82.2	72.6	Yes
Reduce overall costs by performing maintenance before improvements are in critical need of repair	78.8	78.5	76.4	No
Better distribute projects throughout the state to maximize benefits to all regions	73.4	66	81.8	No
Reduce vehicle damage due to deteriorated infrastructure	73	69.7	74	No
Match transit mode to ridership demand, with all modes on the table including priority bus and light rail	72.8	74.8	69.7	Yes
Invest in construction of major transit improvements	72.1	68.1	75.3	No
Create more visionary long-term plan for transportation assets for all modes and works to ensure Illinois regains its place as USA's crossroad	70.9	68.6	73.8	Yes

Finally, in this section, IPCE utilized two types of thematic categories: IDOT's modes and an IPCE-created group similar to IDOT's goals, but more comprehensive and inclusive of the public's contributed responses. Using these categories, ideas categorized as repairs and maintenance had the highest win percentage by a substantial margin (Figure 16). The following categories also had win percentages over 50 percent: investments and funding increases, public transit, equity and access, management and efficiency, and road network.

Fig. 16: The Types of Transportation Ideas Illinois Residents Think are Important

Percent of the time ideas in different categories win. For example,'Repairs and Maintenance won 62 percent of the time. The 'n' refers to the number of ideas included in the category



In regard to ideas with the greatest disparity in rankings between regions (Table 5), residents outside Region 1 were more likely to prioritize ideas related to rural highways, roadway freight, safety and "IDOT's ability to advocate for sound transportation policy and funding," which is the idea with the greatest rank disparity. Region 1 residents, on the contrary, were more likely to prioritize ideas related to public transit (buses, trains and rail) and bikes and pedestrians.

Table 5*

Top Ideas by Difference in Rank between Regions	Absolute RANK Difference	Region 1 RANK	Outside Region 1 RANK	Public Idea?
Enhance IDOT's ability to advocate for sound transportation policy and funding	93	114	21	No
Improve road safety by making roads more freight-friendly	77	107	30	No
Improve highway access for rural populations	63	83	20	No
Charge trucks a toll on all expressways if they operate during AM and PM peak hours as a way to reduce congestion	54	60	114	Yes
Make sure new or improved roads don't interfere with residents' way of life	52	67	15	Yes
Support sustainable practices in the delivery of public transportation	49	72	23	No
Safety for cyclists and pedestrians where there are gaps in local networks and/or dangerous conditions	47	33	80	Yes
Make IDOT data publicly available and easy to share	46	75	29	No
Prioritize multiuse trails for walking and biking for transportation and recreation across the state	46	63	109	Yes
Identify gaps in transit service	45	20	65	No

*The ideas highlighted in orange indicate that residents from outside Region 1 ranked the idea higher than Region 1 residents.

Conclusion

In its efforts to update and improve its public engagement processes, IDOT commissioned IPCE to create this report utilizing an innovative online survey design. This new methodology for obtaining robust and detailed feedback from Illinois residents led to a wealth of data for analysis and incorporation into the 2017 LRTP. Additionally, this process has exciting potential applications for future IDOT public outreach efforts, both at the statewide and local levels. For example, for the current project, IPCE had to remove ideas related to specific locations and projects in order to make each idea applicable to all Illinois residents. On the local level, however, those insightful, publicly-submitted ideas would not only be allowed, but encouraged.

Acknowledgements

Thank you to the Illinois Department of Transportation for investing in the improvement of public engagement and for their support of innovative engagement methods.

We gratefully acknowledge Professor Matthew Salganik and the All Our Ideas research group for developing All Our Ideas and for making it open and free to all. We hope that this study contributes in some way to your excellent work.

For their support in drafting and editing this report, thanks to Paolo Cisneros, Research Assistant; Katie James, Research Specialist; and Callie Silver, Research Assistant, at the Institute for Policy and Civic Engagement.

Lastly, thank you to all members of the public who participated in the engagement process by taking part in the All Our Ideas wiki survey, sharing your ideas and getting others involved. Your contributions form the foundation of this study and we are deeply grateful to you.

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Introduction

The Illinois transportation network is a rightful source of pride for residents of the Prairie State. Illinois boasts more than 100 public-use aviation landing facilities; one of the nation's largest freight rail systems; nearly 150,000 miles of highways, streets and roads and tens of thousands of bridges. The state also counts dozens of public transportation systems, more than a thousand miles of navigable waterways and hundreds of miles of bicycle and pedestrian paths.

Though this large, diverse transportation system plays an important role in supporting both Illinoisans' quality of life and the state's economic competitiveness, it also complicates efforts to effectively plan for future development and maintenance. As part of its mission to provide safe, reliable and sustainable transportation options for nearly 13 million residents, the Illinois Department of Transportation (IDOT) must balance competing needs, priorities, and visions for the future. The agency's task is further complicated by the state's wide spectrum of rural and urban environments.

In order to assist IDOT in effectively gauging public priorities, the University of Illinois at Chicago's Institute for Policy and Civic Engagement (IPCE) conducted a statewide public engagement process in early 2017. The findings of that process will inform the development of IDOT's 2017 Long-Range Transportation Plan (LRTP).

IPCE's public engagement process was designed to engage more Illinoisans and improve the quality of public input, while also obtaining a final set of findings that is statistically representative of the statewide population. Researchers accomplished these goals by conducting engagement in two separate phases: first, by allowing all interested residents to submit feedback and respond to others' suggestions, and second, by convening a representative sample to complete an online survey and provide responses to statewide transportation goals, modal prioritization and specific ideas about transportation. The unique strength of this multi-phased process was its ability to capture high quality ideas from the public and statistically representative public priorities – it was both open and representative.

This report summarizes the findings of the aforementioned engagement process. It is intended to provide additional context for IDOT personnel as they attempt to draft an LRTP that represents the needs and concerns of the citizens they serve.

About the Research Team

The Institute for Policy and Civic Engagement is based at the University of Illinois at Chicago, and focuses on transforming democracy by creating a more fully engaged citizenry with more effective leaders. As a catalyst for learning and action, the Institute creates opportunities for scholars, concerned citizens, students and government officials to actively participate in social discourse, research and educational programs on policy issues and social trends.

The Urban Transportation Center at the University of Illinois at Chicago is dedicated to conducting research, inspiring education and providing technical assistance on urban transportation planning, policy, operations and management. Since 1979, the UTC has delivered innovative research and education to solve real-world transportation problems. The strategic goal of UTC transportation research is to promote livable communities throughout the nation.

About the Long-Range Transportation Plan

IDOT is federally mandated to prepare an LRTP every five years in accordance with 23 USC 135(f), 49 USC 5304(f) and 23 CFR 450-210.[4] State law also requires the creation of an LRTP, as outlined in Public Act 097-0032.[5] The Federal Highway Administration and Federal Transit Administration expect these plans to inform the development and implementation of Illinois' multimodal transportation system while also identifying how the network will meet the state's economic, transportation, development and sustainability goals. Federal requirements dictate the plan account for a 20+ year period.

Illinois' most recent LRTP was completed in 2012. That document – *Illinois State Transportation Plan: Transforming Transportation for Tomorrow* – focuses on a wide range of local transportation goals and challenges confronting the state. IDOT sought public input through traditional venues, including telephone, online and paper surveys, as well as at public meetings. Information about public involvement in the plan can be found in IDOT's supplemental report to the 2012 LRTP entitled *Agency Coordination and Public Involvement*.[6]

In anticipation of its 2017 LRTP, IDOT prioritized improving its public outreach process. In 2016, IPCE and UTC produced a report for IDOT entitled *Recommendations to Enhance Quality Engagement*. As the report describes, IDOT commissioned the report in order to "study ways in which it could improve and enhance its public engagement practices, especially those involving underserved or disadvantaged populations. The agency wished to increase the quality and quantity of public feedback received and extend its reach into disadvantaged communities."[7]

This report is a continuation of last year's work, building on its suggestions and expanding IDOT's public outreach methods using an innovative web survey platform.

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[4] *Long-Range Statewide Transportation Plan.* Federal Transit Administration. https://www.transit.dot.gov/regulations-and-guidance/transportation-planning/long-range-statewide-transportation-plan. Accessed May 11, 2017.

[5] Illinois General Assembly, Public Act 097-0032. http://www.ilga.gov/legislation/publicacts/fulltext.asp?Name=097-0032. Accessed on July 30, 2017.

[6] Illinois Department of Transportation, "Statewide Transportation Plan: Agency Coordination and Public Involvement," Dec. 2012. http://www.illinoistransportationplan.org/pdfs/final_report/08_agency_coordination.pdf. Accessed July 30, 2017.

[7] Institute for Policy and Civic Engagement, "Recommendations to the Illinois Department of Transportation to Enhance Quality Public Engagement," June 2016. https://utc.uic.edu/research/recommendations-to-the-illinois-department-of-transportation-to-enhance-quality-public-engagement/. Accessed July 30, 2017.

Research Questions

The purpose of this report is to generate high quality and representative input from the public regarding priorities and ideas for the transportation network in Illinois. In order to do so, this study sought to answer three main questions:

1. To what extent does the public prioritize the transportation goals put forth in the LRTP?
2. To what extent does the public prioritize the transportation modes included in the LRTP?
3. What specific ideas does the public feel are most important for transportation in Illinois?

Methodology

In this section, IPCE seeks to be as explicit and transparent as possible regarding the methodologies employed in the current study. This is in keeping with American Association for Public Opinion Research (AAPOR) recommendations, which emphasize that "transparency is essential" and "a clear description of methods and assumptions is essential for understanding the usefulness of the estimates," especially when working with a non-probability sample where respondents are self-selected and not randomly chosen to participate.[8]

The two primary phases of the engagement process designed by IPCE:

Phase 1: Public idea generation

Phase 2: Representative public prioritization

IPCE's multi-phase study enabled researchers to obtain information that satisfied goals of both openness and generalizability. A wide range of the involved public was reached through the pairwise comparison wiki survey in Phase 1, while the online survey in Phase 2 was completed by a representative sample of the population, allowing for findings to be generalized to the entire population of Illinois. The research process is depicted in the Figure 1 on the next page:

[8] Baker and Brick, et. al., "Report of the AAPOR Task Force on Non-Probability Sampling," June 2013. https://www.aapor.org/AAPOR_Main/media/MainSiteFiles/NPS_TF_Report_Final_7_revised_FNL_6_22_13.pdf. Accessed on July 30, 2017.

Fig. 1: Overview of Online Public Engagement for IDOT's Long Range Transportation Plan

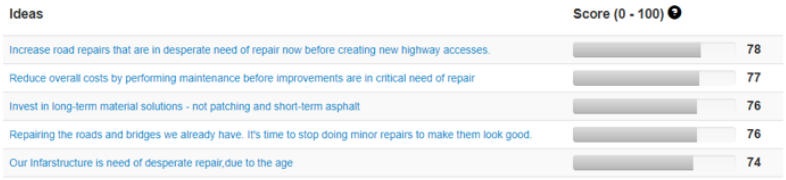
Institute for Policy and Civic Engagement

Phase 1: Idea generation

Inputs	Activities	Outputs
IDOT & IPCE develop 'objectives' statements (seed ideas) for the All Our Ideas pair-wise wiki survey. **IDOT promotes the All Our Ideas survey** via media, social media, through their network, etc.	**IL Residents ages 18 and up vote** for the ideas they think are best for transportation in IL. (Fig. 1) **Users can submit their own ideas,** which can become part of the list of competing ideas.	A **final list of ideas** ranked from those users are most likely to support down to those users are least likely to support. (See Fig. 2) This list includes IPCE/IDOT 'seed ideas' and user generated ideas.

Fig. 1: Users vote for one of the two ideas, and may add their own idea below

Fig. 2: Example results, with the idea most likely to win a head to head comparison on top



Phase 2: Levels of Investment, Ideas, and a Representative Voice

Inputs	Activities	Outputs
IDOT & IPCE develop the high level goals and descriptions to be used in the Qualtrics data collection platform **The Qualtrics survey incorporates the full list** of ideas from the All Our Ideas survey results (or a subset determined by IDOT & IPCE)	Two statistically representative web panels from Region 1 and Outside Region 1 **complete the Qualtrics questionnaire.** Panelists first express levels of support for IDOT goals and transport modes. (Fig. 3) Then, panelists vote on 15 random pairs of ideas from the final list from phase 1. (Fig. 4)	Public input gained from the Qualtrics survey can be generalized to all IL residents within a known margin of error. Results include: Relative levels of public support (e.g. budgetary allocation) for each **IDOT goal.** Relative levels of public support (e.g. budgetary allocation) for each **mode of transportation.** **A list of up to hundreds of ideas** ranked from having most public support to least. These include IPCE/IDOT and user generated ideas. In IPCE's report, IPCE will categorize these ideas by both goal areas and mode.

Fig. 3: Users input a dollar amount based on their preferences.

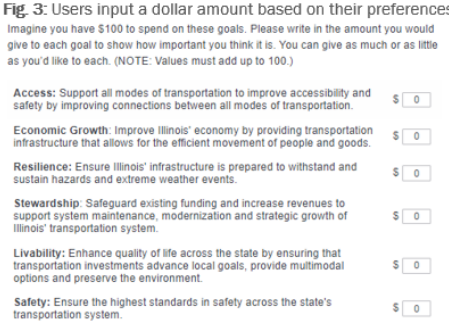
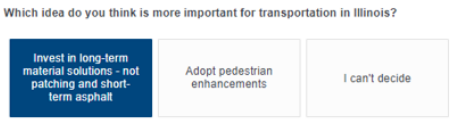


Fig. 4: Like the All Our Ideas platform, but with a statistically representative sample of Residents

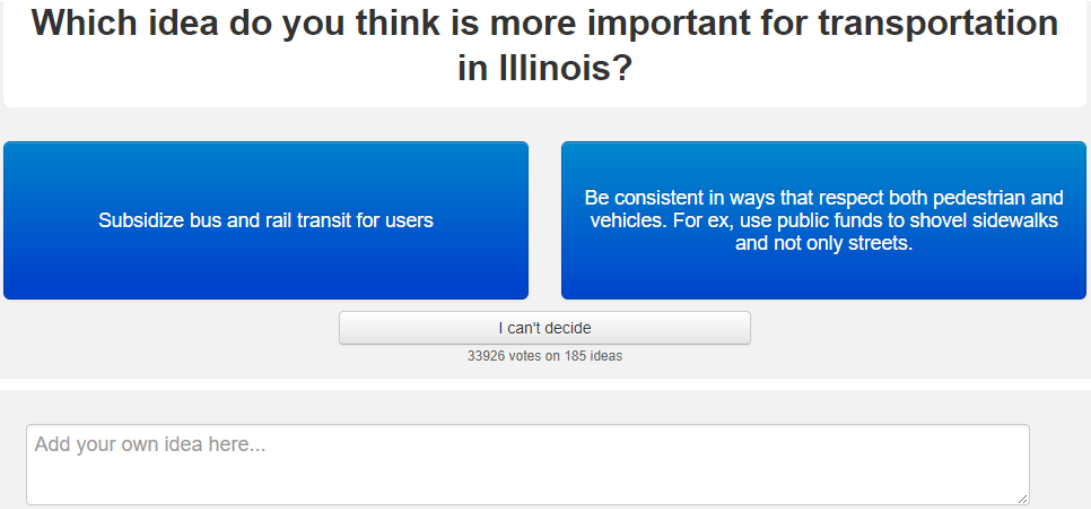


Phase 1: Public idea generation

This initial phase involved launching a publicly accessible pairwise comparison wiki survey prompting Illinois residents to answer the question: "Which idea do you think is more important for transportation in Illinois?" (Figure 2). Researchers utilized an open-source wiki survey platform called All Our Ideas[9] for this phase, due to its unique features not found in traditional survey research.

As the creators of the All Our Ideas platform explain, wiki surveys are inspired by online information aggregation systems such as Wikipedia as well as traditional survey research.[10] Such tools function by presenting users with two randomly selected pieces of information (in this case, project and/or priority ideas for transportation in Illinois) and allowing them to select a preferred response, indicate they cannot decide between the two, or offer an alternative. User submissions that meet a set of researcher-specified criteria (see Appendix V) are then added to the pool of ideas from which the All Our Ideas algorithm selects to present to users.

Fig. 2 The All Our Ideas wiki survey platform



The wiki survey format has numerous characteristics that are valuable for collecting public input, which the All Our Ideas creators enumerate in their article *Wiki Surveys: Open and Quantifiable Social Data Collection*.[11] It allows for "greediness" in that it permits users to contribute as much (or as little) information as they would like. It is "collaborative," as many of the best ideas are submitted by users and their distinctive phrasings can reveal the public's preferences. It is also "adaptive," as it is "continually optimized to elicit the most useful information, given what is already known." Finally, by randomly generating pairs that users are not able to control, the pairwise comparison format prevents users from gaming or

[9] http://allourideas.org/
[10] Salganik MJ, Levy KEC, "Wiki Surveys: Open and Quantifiable Social Data Collection," *PLoS ONE* 10(5): e0123483, 2015. https://doi.org/10.1371/journal.pone.0123483. Accessed July 30, 2017.
[11] Ibid, p. 2-4.

manipulating the results, while also preventing collective effects where users become increasingly more likely to vote for only the top-rated ideas. Following the conclusion of the voting process, researchers are able to generate a ranked list that identifies which items are mostly likely to be preferred by the public.

On the day IPCE launched its public-facing All Our Ideas survey, it contained 64 "seed" ideas that IDOT and IPCE developed, many of which were based on the *Transforming Transportation for Tomorrow* 2012 LRTP. The wiki survey opened on February 8, 2017 and closed on March 8, 2017. During this time, there were 823 unique visitors to the All Our Ideas wiki survey, of which 698 were from Illinois.[12] Seventy percent of the participating Illinoisans were from the Chicago metro area. In total, visitors voted 36,353 times and eight of the top ten ideas were user-submitted.[13]

It is important to note that participants in this phase were not representative of the overall Illinois population. In fact, because the survey was publicized by IDOT staff through existing channels of communication, it is likely that a large percentage of users were disproportionately aware of or otherwise involved in IDOT's work. Still, the results generated in this phase provided a foundation for the second phase of engagement that sought to build on Phase 1 results, while generating a clearer picture of the transportation concerns of the broader Illinois population.

Transition to Phase 2

In total, 322 ideas were submitted by users in Phase 1, though only 121 were included in the All Our Ideas survey for others to vote for or against.[14] In preparation of Phase 2, IPCE and IDOT created the final idea dataset by removing duplicates, comments, specific locations and very low-ranking ideas. The final dataset was comprised of 134 competing ideas, 63 of which were IDOT seed ideas and 71 of which were submitted by users in Phase 1.

As IPCE deliberated on how to proceed with Phase 2, selecting the appropriate research firm became a primary focus. One concern was the quality of non-probability surveys. The authors of an AAPOR study of 60 non-probability surveys in 2013 found that these surveys varied widely in efficacy and accuracy. Though the authors raise numerous concerns about non-probability surveys, they also note that it is difficult to generalize about non-probability surveys, as there is a wide variety of methodologies rather than one simple non-probability framework. The authors do maintain, however, that technology is constantly evolving and improving and that some online vendors perform substantially better than others as a result of their methodology.

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[12] Google.com. (2017). *Features – Google Analytics*. Available at: http://www.google.com/analytics/features/ Accessed Mar. 10, 2017.

[13] To see the full list of results from Phase 1, see https://www.allourideas.org/IDOTideas/results

[14] The number 121 is a better indicator of the actual number of ideas submitted. Of the ideas NOT included, the main reasons for not being included were: 108 were actually comments (often about one of the ideas they saw or about the survey itself); 60 were not applicable to all Illinois residents (i.e. they were too specific); and 32 ideas were duplicates. See appendix V for a complete breakdown.

With these concerns in mind, IPCE researched online vendors of non-probability panels with the primary goals of the study being high-quality, cost-effective and generalizable to the entire population of Illinois. An invaluable resource during this effort was a Pew Research Center report entitled, "Evaluating Online Nonprobability Studies."[15] This study provided some similar observations to the AAPOR study (for example, non-probability studies are not monolithic and vary in quality), while also highlighting more specific insights, such as:

> A representative demographic profile does not predict accuracy. For the most part, a sample's unweighted demographic profile was not a strong predictor of the accuracy of weighted survey estimates…The implication is that what matters is that the respondents in each demographic category are reflective of their counterparts in the target population. It does not do much good to get the marginal distribution of Hispanics correct if the surveyed Hispanics are systematically different from Hispanics in the larger population.

In other words, online vendors must do more than simply fill demographic quotas. The Pew report also ran a quantitative experiment to compare the performance of eight non-probability samples. One vendor consistently came out ahead of all other non-probability samples in these tests: YouGov (Sample I). It even outperformed Pew's in-house probability sample, ATP, by multiple metrics. Due to its sophisticated methodology and exceptional performance, IPCE decided to work with YouGov for Phase 2.

YouGov's multi-staged sampling method is called *sample matching*.[16] First, YouGov draws a *target sample* from the existing target population. Then, in the second stage, YouGov creates a *matched sample*, whereby it matches respondents to the sampling frame using a few different methods and then assigns variables a weight. These details, provided by YouGov, describe the sampling process and margin of error for this study:

> YouGov interviewed 1282 respondents who were then matched down to a sample of 1000 to produce the final dataset (500 in Cook, Lake, McHenry, Kane, DuPage and Will counties; and 500 in other Illinois counties).[17] The respondents were matched to a sampling frame on gender, age, race and education. The frame was constructed by stratified sampling from the 2013 American Community Survey (ACS) sample (subset on the relevant geographic areas) with selection within strata by weighted sampling with replacements (using the person weights on the public use file).
>
> In each sample group of 500, the matched cases were weighted to the sampling frame using propensity scores. The matched cases and the frame were combined and a logistic regression was estimated for inclusion in the frame. The propensity score function included age, gender, race/ethnicity and years of education. The propensity scores were grouped into deciles of the estimated propensity score in the frame and post-stratified according to these deciles. A four-way post-stratification was then applied to these weights on age, gender, race, and education level, to produce the final country group weight.

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[15] Pew Research Center, May 2016, "Evaluating Online Nonprobability Surveys."

[16] For an extensive description of YouGov's sampling method, see: Ansolabehere and Rivers "Cooperative Survey Research," *Annual Review of Political Science*, 2013. http://www.annualreviews.org/doi/abs/10.1146/annurev-polisci-022811-160625. Accessed on July 30, 2017.

[17] For a detailed description of response rates, see appendix VI.

The sample was then combined and the group weights were post-stratified to the country group distribution, as well as a four-way post-stratification on age, gender, race and education level, to produce an overall weight

The sample from Cook, Lake, McHenry, Kane, DuPage and Will counties has a weighted margin of error of +/-5.35, and the sample from other Illinois counties has a weighted margin of error of +/-5.54. The full sample has a weighted margin of error of +/-4.09. Each was calculated at a 97.5 percent confidence level.[18]

The total sample contains 1,000 Illinois residents consisting of two geographically bound groups containing 500 people each: the "Region 1" group represents residents from the NE corner of Illinois in Cook, Lake, McHenry, Kane, DuPage and Will counties, and the "Outside Region 1" group represents residents of Illinois who live in an area other than Region 1. The resulting weighted summary statistics can be seen in Table 1 below:

Table 1: Weighted Summary Statistics By Geographic Area

	ILLINOIS			REGION 1			OUTSIDE REGION 1		
Demographic	**Unweighted Sample**	**Weighted Sample**	**Frame**	**Unweighted Sample**	**Weighted Sample**	**Frame**	**Unweighted Sample**	**Weighted Sample**	**Frame**
Unweighted N	1,000	1,000	10,000	500	500	10,000	500	500	10,000
GENDER									
Male	46%	48%	48%	47%	48%	48%	45%	49%	49%
Female	54%	52%	52%	53%	52%	52%	55%	51%	51%
AGE									
18-29	16%	22%	22%	19%	23%	22%	13%	20%	21%
30-44	25%	27%	26%	30%	28%	28%	19%	24%	24%
45-64	41%	34%	34%	35%	33%	34%	46%	35%	35%
65+	19%	18%	18%	17%	16%	16%	21%	21%	20%
RACE									
White	79%	67%	66%	67%	56%	56%	91%	85%	85%
Black	9%	13%	14%	14%	17%	17%	4%	8%	8%
Hispanic	6%	13%	14%	11%	18%	19%	2%	4%	4%
Other	6%	6%	6%	9%	8%	8%	4%	3%	3%
EDUCATION									
HS or Less	30%	39%	39%	26%	36%	37%	33%	43%	43%
Some College	35%	32%	31%	32%	31%	29%	39%	35%	35%
College Grad	24%	18%	19%	27%	21%	21%	20%	15%	14%
Post Grad	12%	11%	11%	15%	13%	13%	8%	7%	7%

[18] Also provided by YouGov: "The 'margin of error' is calculated using model-based standard errors, which estimate the variability of estimates from repeated application of the same procedures. Model-based standard errors depend on the assumption that responses are independent and that the selection mechanism is 'missing at random.' (See R.J.A. Little and D.B. Rubin, Statistical Analysis with Missing Data, 2nd ed., Wiley, 2002.) This means that . . . given any specific combination of matching and weighting variables, we assume that panelists have the same likelihood [answering other questions in the survey] as non-panelists with the same characteristics. It does not assume that the data come from a probability sample with known probabilities of selection."

Phase 2: Representative public prioritization

The Phase 2 survey asked YouGov's sample of 1,000 Illinois residents to complete three tasks:

1. Indicate what percentage of IDOT's budget they would invest in various transportation goals. Their submissions were required to add up to 100. Options included:
    a. Economic growth
    b. Livability
    c. Access
    d. Resilience
    e. Stewardship
    f. Safety

2. Indicate what percentage of IDOT's budget they would invest in various transportation modes. Their submissions were required to add up to 100. Options included:
    a. Aviation
    b. Bicycle and pedestrian
    c. Freight
    d. Rail
    e. Public transit (trains and busses)
    f. Road network
    g. Waterways and ports

3. Vote on 15 randomly selected pairs of ideas.
    a. 134 competing ideas: 63 of these were (IDOT) seed ideas and 71 were submitted by the public in Phase 1[19]

In designing this survey, IPCE randomized nominal response options to prevent any bias introduced by the ordering of response options (e.g. 'satisficing' bias). As a result:

a. For the goals and modes questions, the order was randomized for each respondent.
b. For the pairwise comparisons, the selection of 2 of 134 ideas was randomized for 14 of the 15 comparisons. Pairwise comparison #5 was a data quality check.[20]

[19] These ideas only appear in the pairwise comparisons part of the survey (i.e., the 15 questions that all begin with the question: "Which idea do you think is more important for transportation in Illinois?")

[20] For the pairwise comparison questions, the left response option was a randomly selected idea, the right idea option stated "Please select this response to show that you are reading through all response options in this survey," and the final option was the 'I can't decide option' that appeared in all pairwise comparisons. Only respondents who passed the data quality check were included in the final sample.

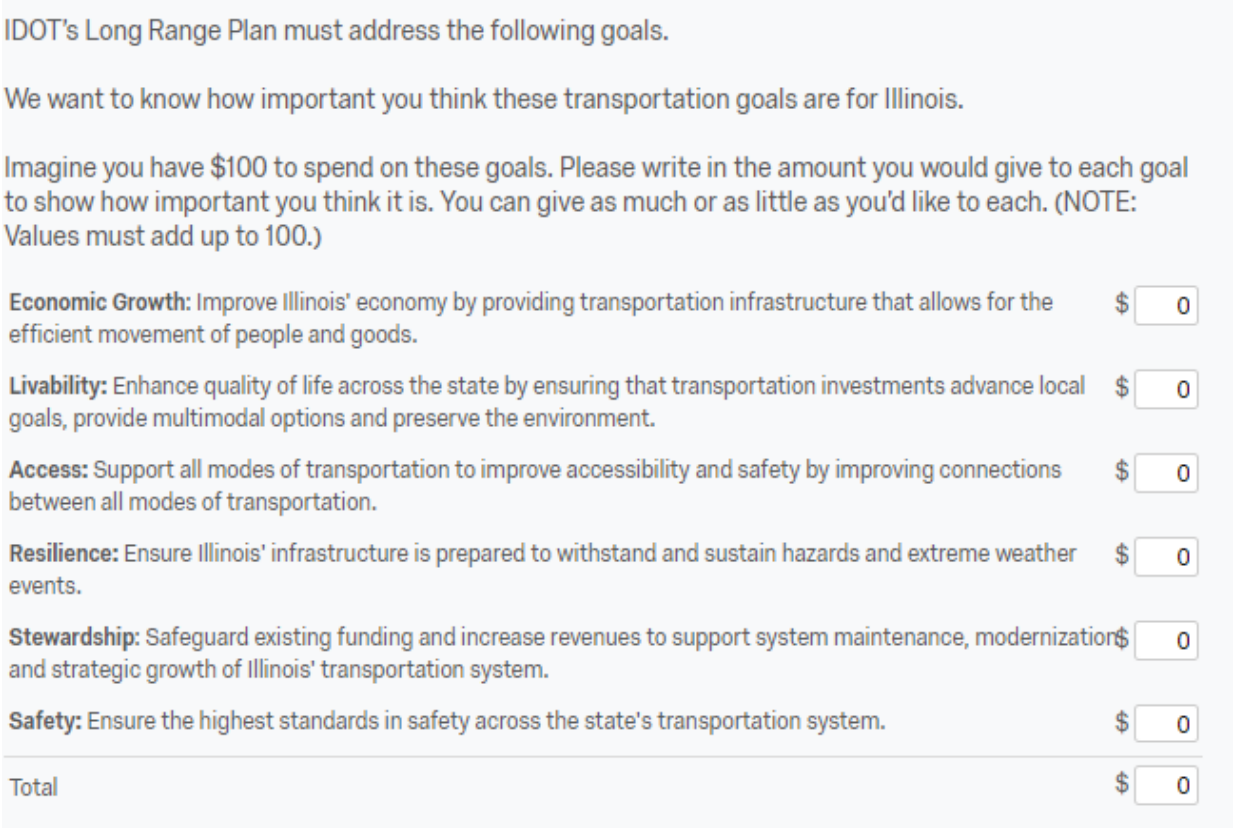
Section 1: Public Prioritization of IDOT Goals

IDOT's LRTP will address the following transportation goals: economic growth, livability, access, resilience, stewardship and safety.

Resident Priorities Statewide

Illinois residents were asked to imagine they had $100 to spend on these goals and to indicate the amount they would give to each transportation goal to demonstrate its level of importance. Figure 3 shows what the respondents saw for this budget priorities question, and Figure 4 shows the results: the average amount residents give to each goal based on perceived importance.

Fig 3. Snapshot from the online questionnaire

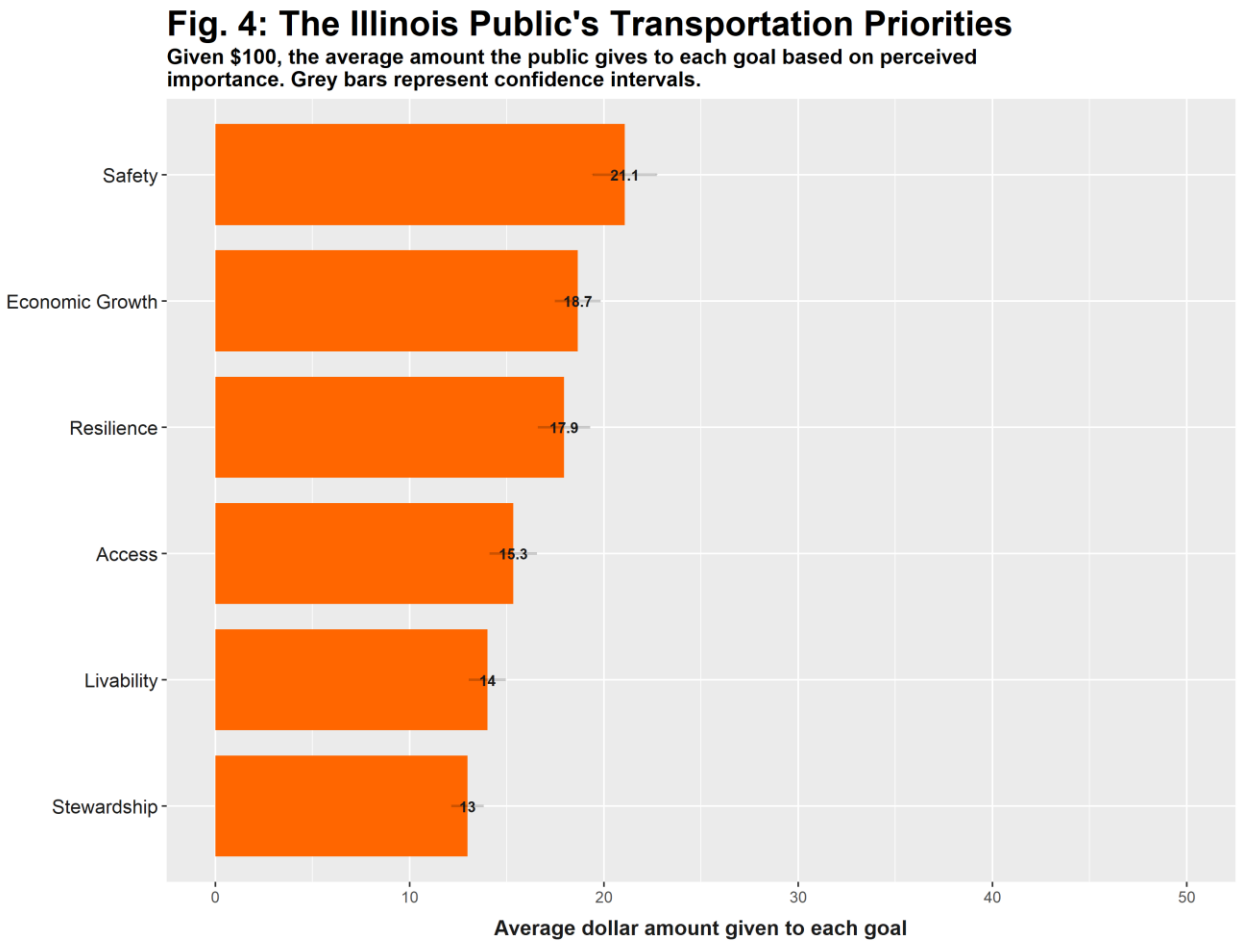


IDOT's Long Range Plan must address the following goals.

We want to know how important you think these transportation goals are for Illinois.

Imagine you have $100 to spend on these goals. Please write in the amount you would give to each goal to show how important you think it is. You can give as much or as little as you'd like to each. (NOTE: Values must add up to 100.)

Economic Growth: Improve Illinois' economy by providing transportation infrastructure that allows for the efficient movement of people and goods.	$ 0
Livability: Enhance quality of life across the state by ensuring that transportation investments advance local goals, provide multimodal options and preserve the environment.	$ 0
Access: Support all modes of transportation to improve accessibility and safety by improving connections between all modes of transportation.	$ 0
Resilience: Ensure Illinois' infrastructure is prepared to withstand and sustain hazards and extreme weather events.	$ 0
Stewardship: Safeguard existing funding and increase revenues to support system maintenance, modernization and strategic growth of Illinois' transportation system.	$ 0
Safety: Ensure the highest standards in safety across the state's transportation system.	$ 0
Total	$ 0

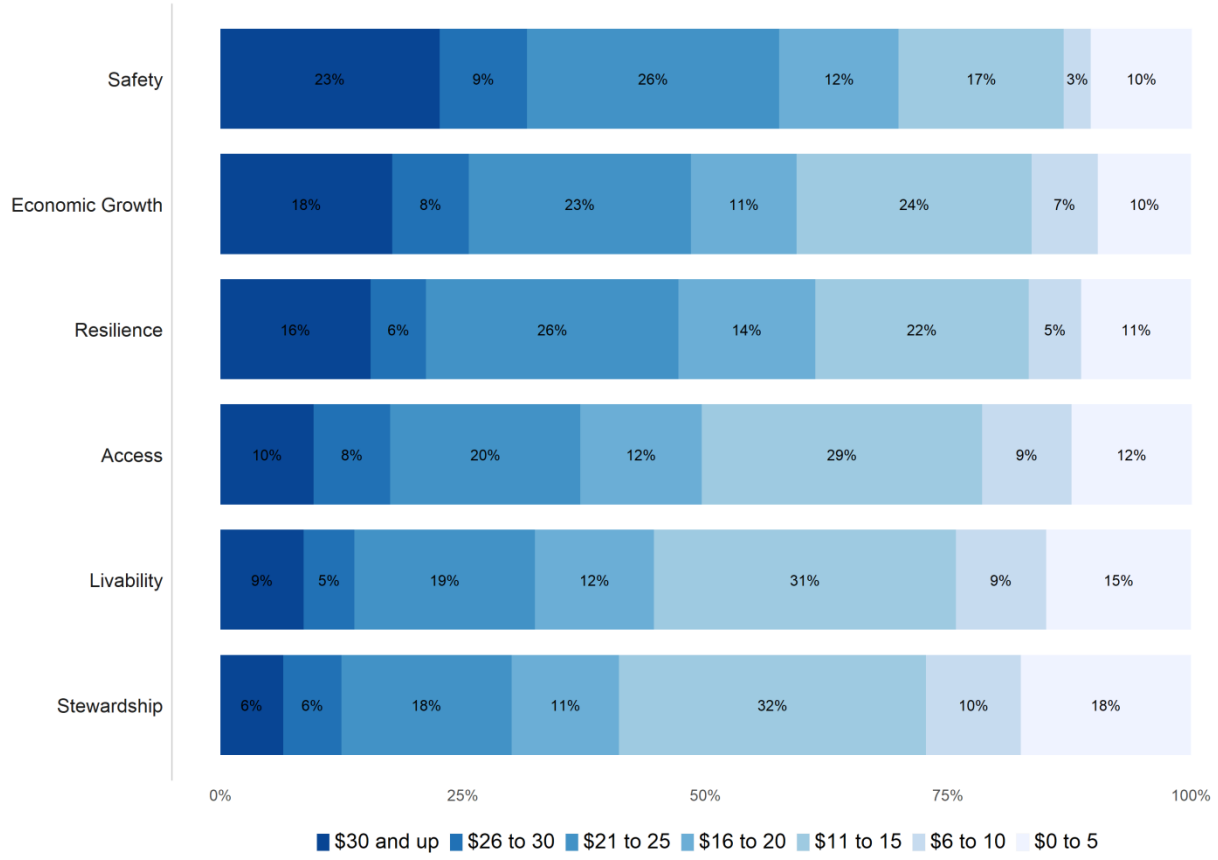


The public prioritizes safety and, on average, gives $21.10 toward this goal. Economic growth and resilience are the next two most important goals identified by the public. On average, people allot $18.70 and $17.90 to these goals, respectively. For the goal of access, residents give an average of $15.30. Livability and stewardship are low priorities for the public, as seen by the averages attributed to each; the public gives an average of $14 to livability and $13 to stewardship.

Figure 5 provides another way of looking at how Illinois residents prioritize transportation goals and reveals patterns hidden when looking just at averages. For example, 23 percent of residents distribute one-third or more of their money to safety, while only 6 percent of residents give that amount to stewardship.

Fig. 5: Transportation Goals Priorities for Illinois Residents

Given $100, the average amount the public gives to each GOAL based on perceived importance



Over one-half of residents (58 percent) distribute $21 or more to safety, and nearly one-third (32 percent) of residents give over one-quarter of their dollars to this goal. For economic growth, almost one-half (49 percent) of residents allot $21 or more to this goal, and just over one-quarter (26 percent) of residents give over one-quarter of their money. The results were similar for resilience, where 48 percent of residents give $21 or more to this goal, and 22 percent give $26 or more. However, for access, livability, and stewardship, over one-half of residents distribute $15 or less to these goals, demonstrating their low priority. More specifically, 50 percent of residents give $15 or less to access, 55 percent give $15 or less to livability, and 60 percent give $15 or less to stewardship. Nearly one-quarter of residents (24 percent) give $10 or less to livability, and 28 percent of residents give $10 or less to stewardship.

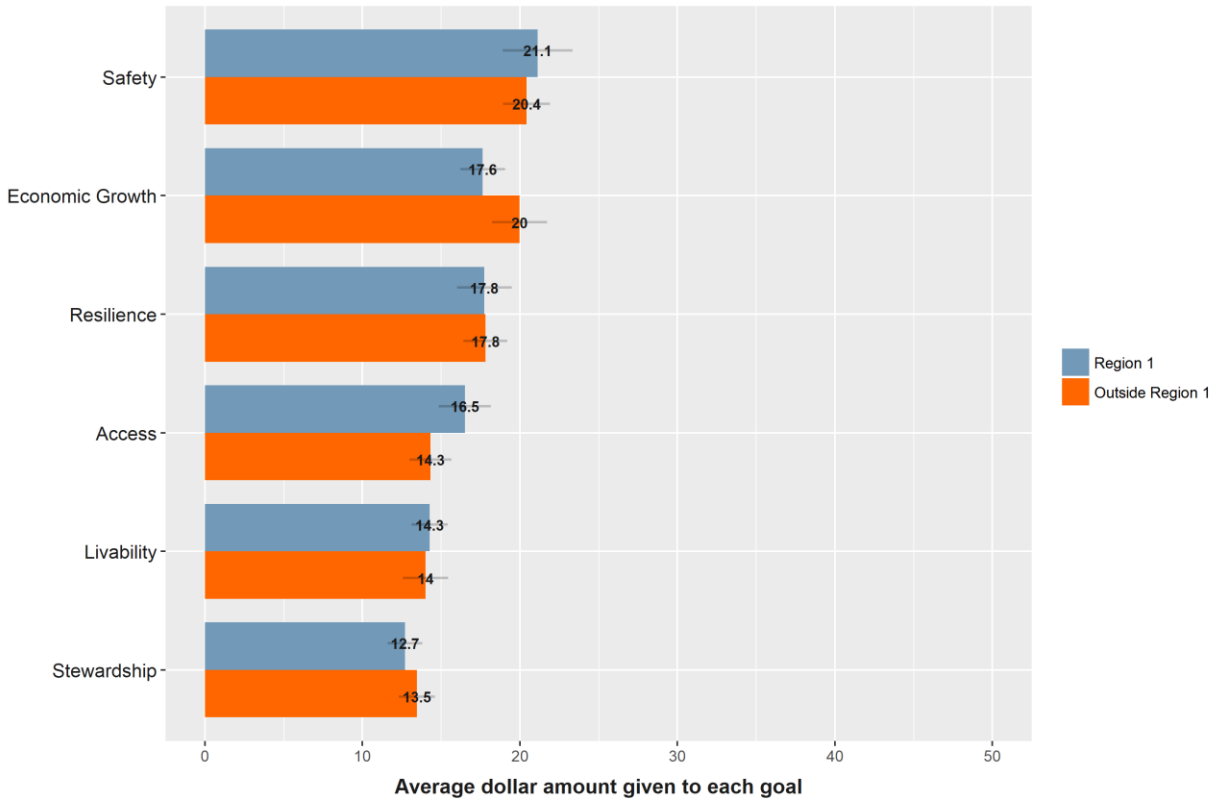
Resident Priorities by Region

Analyzing residents' prioritization of goals by geographic group reveals differences in how the residents of Region 1 prioritize goals versus those residents from other parts of the state. For Region 1 residents, the priority order of goals nearly matches that of Illinois residents overall,

where the public prioritizes safety first and attributes an average of $21.10 to this goal. However, unlike for Illinois residents overall, resilience is prioritized second, followed closely by economic growth. In Region 1, the public gives an average of $17.80 to resilience and an average of $17.60 to economic growth. In terms of access, the public allocates an average of $16.50. For livability and stewardship, residents give $14.30 and $12.70, respectively.

Fig. 6: The Illinois Public's Transportation Priorities by IDOT Region

Given $100, the average amount the public gives to each goal based on perceived importance. Grey bars represent confidence intervals.



For those living outside of Region 1, the priority order of goals is the same as that of Illinois residents overall. The public indicates safety as the number one priority and, on average, gives $20.40 to this goal. This is closely followed by economic growth, where the public gives an average of $20. Regarding resilience, they attribute an average of $17.80. For the lower priorities, the public gives access an average of $14.30, livability an average of $14, and stewardship an average of $13.50.

The high similarity of ranking of goals by region is notable. The two goal areas with the largest difference between regions are economic growth and access, and these differences are statistically significant (p-value is below 0.05).

Figure 7 below shows how Region 1 residents distribute $100 based on importance. As it is for Illinois residents overall, Region 1 residents tend to assign the largest amounts to safety, with

22 percent assigning $30 or more to that goal. An interesting observation is that for Region 1 residents, although the average amount given to resilience is slightly higher than economic growth, a higher percentage give more than $30 to economic growth (16 percent) than to resilience (13 percent).

Fig. 7: Transportation Goals Priorities for Illinois Residents Living within IDOT Region 1 (the Chicago Area)

Given $100, the average amount the public gives to each GOAL based on perceived importance

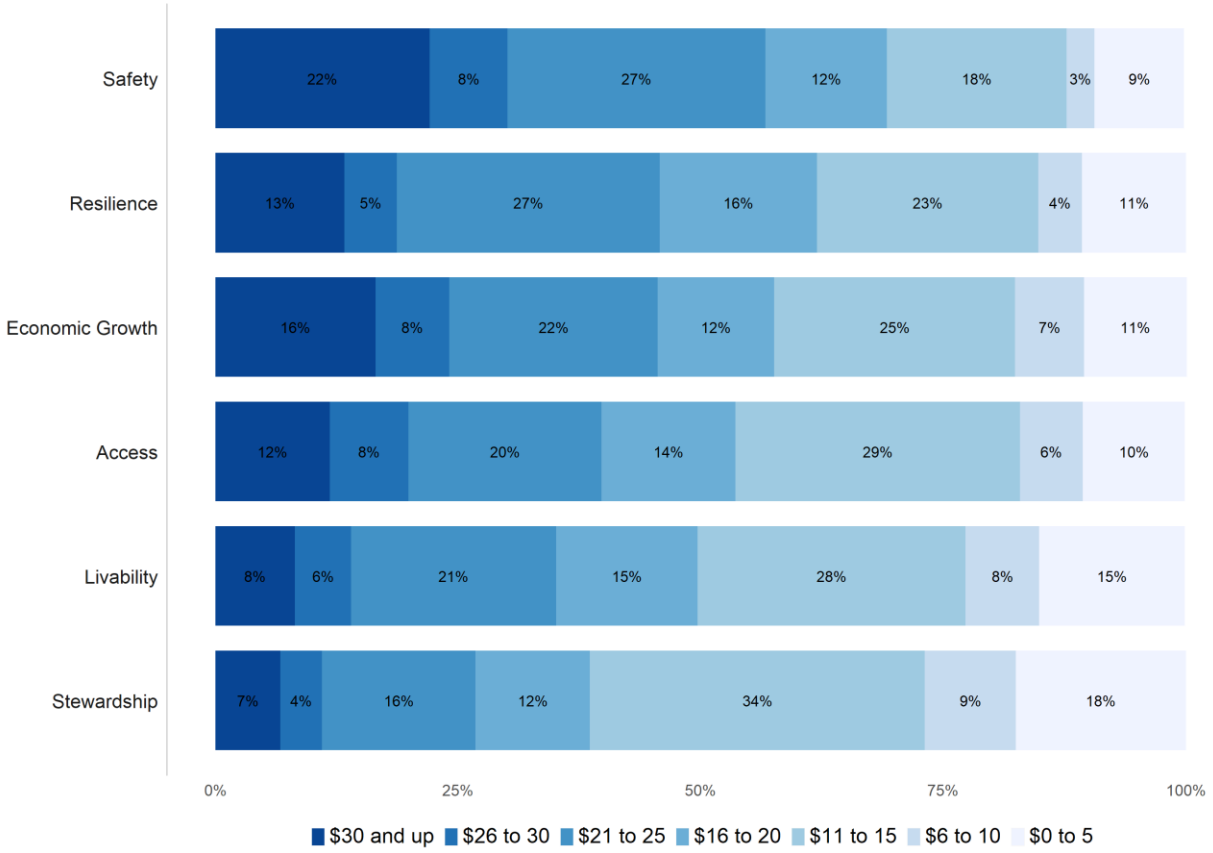
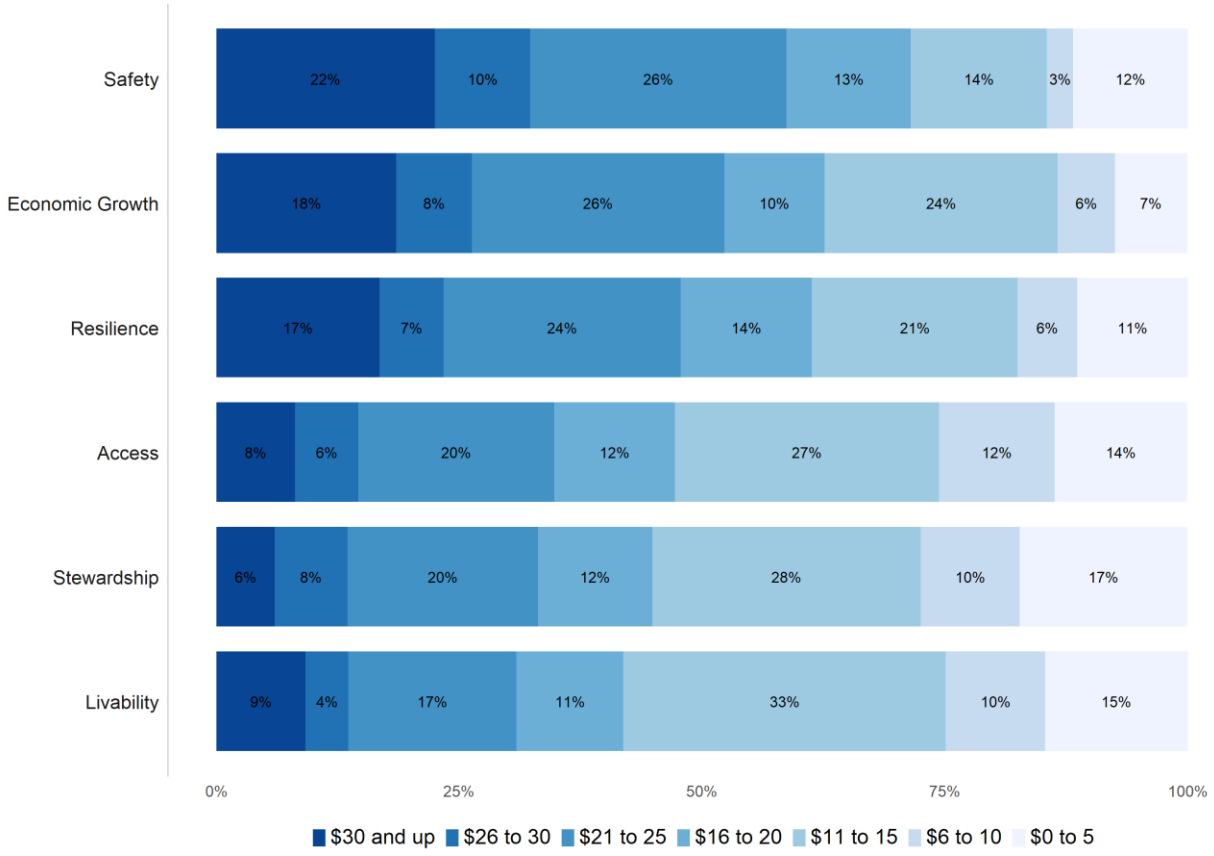


Figure 8 below shows how residents outside Region 1 distribute $100 based on importance. Again, residents outside Region 1 tend to assign the largest amounts to safety, with 22 percent of those who give money to it assigning $30 or more to that goal. Residents outside Region 1 give $30 or more to economic growth at a slightly higher rate than resilience, which flips the order of those two goal areas compared to the Region 1 residents. Overall, residents outside Region 1 more evenly distribute $100 across all goal areas than Region 1 residents.

Fig. 8: Transportation Goals Priorities for Residents living outside of IDOT Region 1

Given $100, the average amount the public gives to each GOAL based on perceived importance



Summary

When asked to distribute $100 across the IDOT LRTP goal areas, residents clearly prioritize safety as the most important goal, based on the average amount given to that goal area. Economic growth and resilience goals follow next, although residents outside Region 1 rank resilience slightly higher than economic growth. Access consistently ranks in the middle, while stewardship and livability rank the lowest as priority goal areas.

Section 2: Public Prioritization of IDOT Modes

IDOT's LRTP must also address the following modes of transportation: aviation, bicycle and pedestrian, truck freight, rail freight, public transit (trains and buses), road network and waterways and ports.

Resident Priorities Statewide

To understand how important each mode of transportation is to the public, Illinois residents were again asked to imagine they had $100 to spend on these modes and to indicate how much they would give to each mode based on its importance. Figure 9 shows what the respondents saw for this budget priorities question, and Figure 10 shows the results: the average amount residents give to each goal based on perceived importance.

Fig 9. Snapshot from the online questionnaire

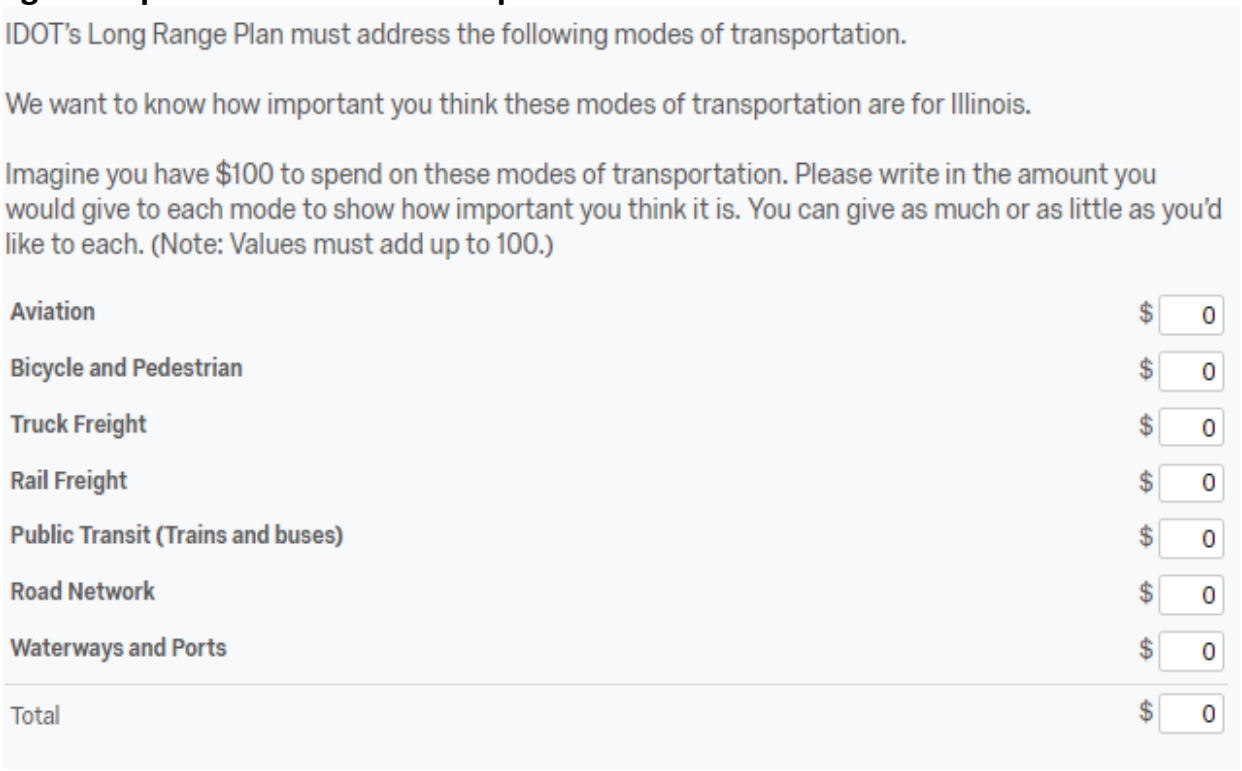
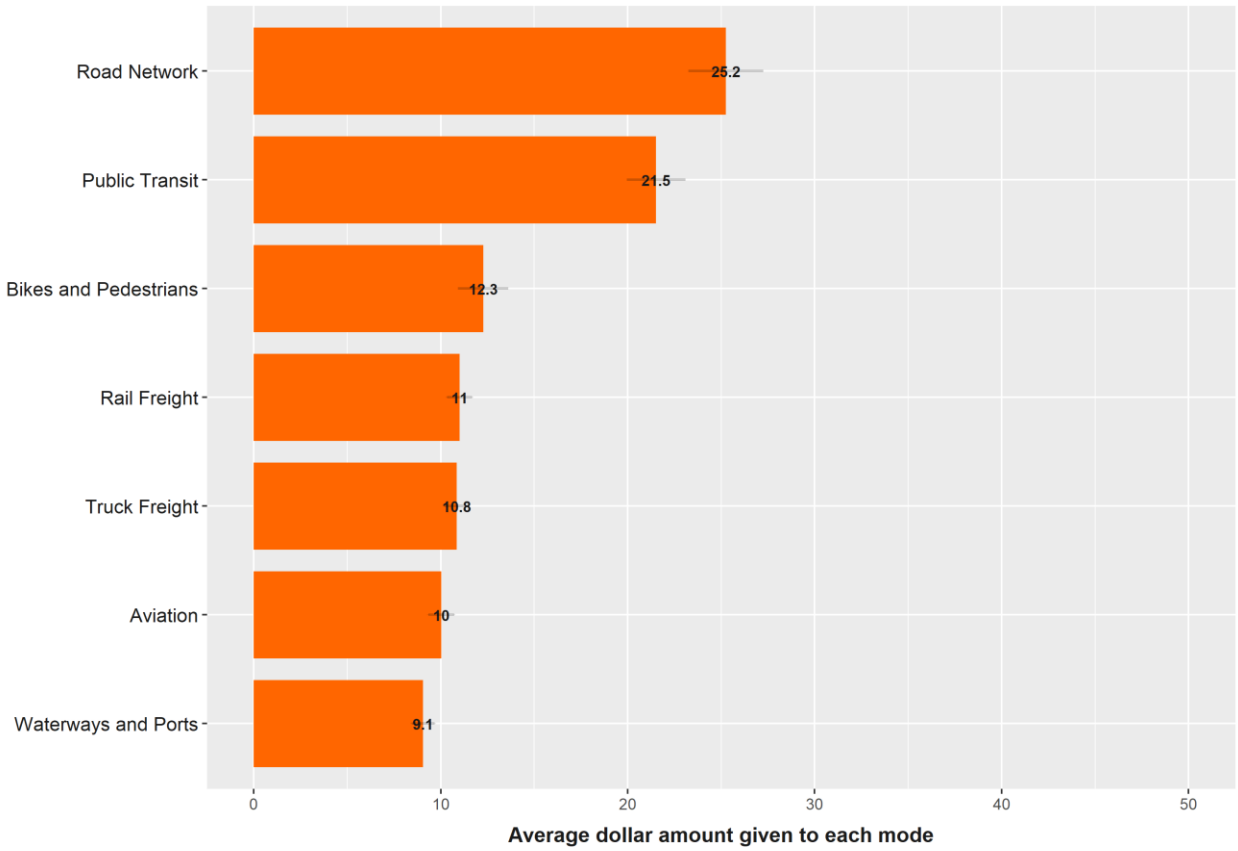


Fig. 10: The Illinois Public's Transportation Priorities

Given $100, the average amount the public gives to each mode based on perceived importance. Grey bars represent confidence intervals.

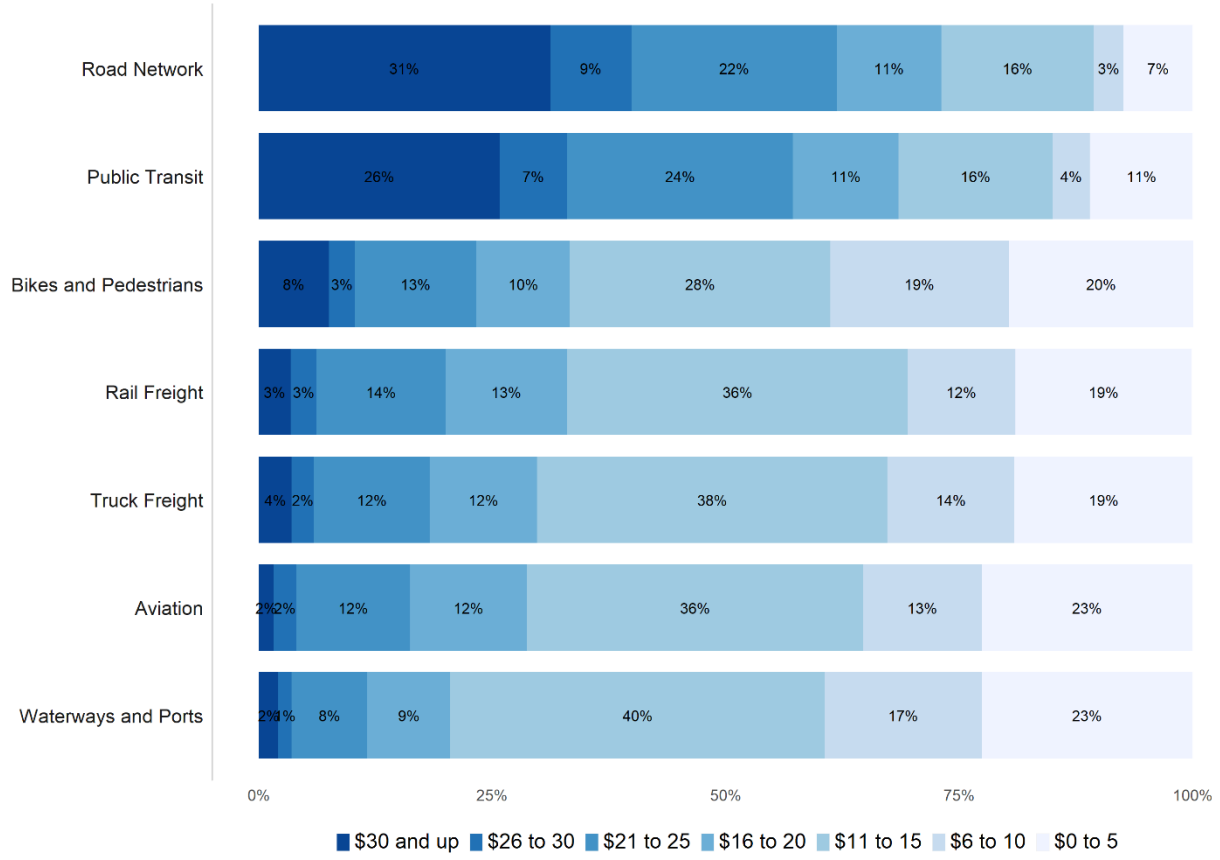


The road network and public transit emerged as the most important modes based on the average attribution of dollars to each. Illinois residents give an average of $25.20 to road network, and $21.50 to public transit. The bikes and pedestrians mode ranks third most important. The public gives an average of $12.30 to this mode, which is nearly half of that which they give to road networks. They also attribute an average of $11 to rail freight, $10.80 to truck freight and $10 to aviation. Waterways and ports is least important, as residents indicate an average of $9.10 for this mode.

Figure 11 shows how Illinois residents tend to distribute $100 across the modes. The road network and public transit modes are most highly prioritized, with 31 percent and 26 percent, respectively, giving $30 or more to those modes. The next highest percentage of those assigning $30 or more to a mode is 8 percent given to the bikes and pedestrians mode. The distribution within the remaining modes of rail freight, truck freight, aviation and waterways and ports is fairly similar, with the largest percentages giving between $11 and $15 of $100 to these categories.

Fig. 11: Transportation Modes Priorities for Illinois Residents

Given $100, the average amount the public gives to each MODE based on perceived importance

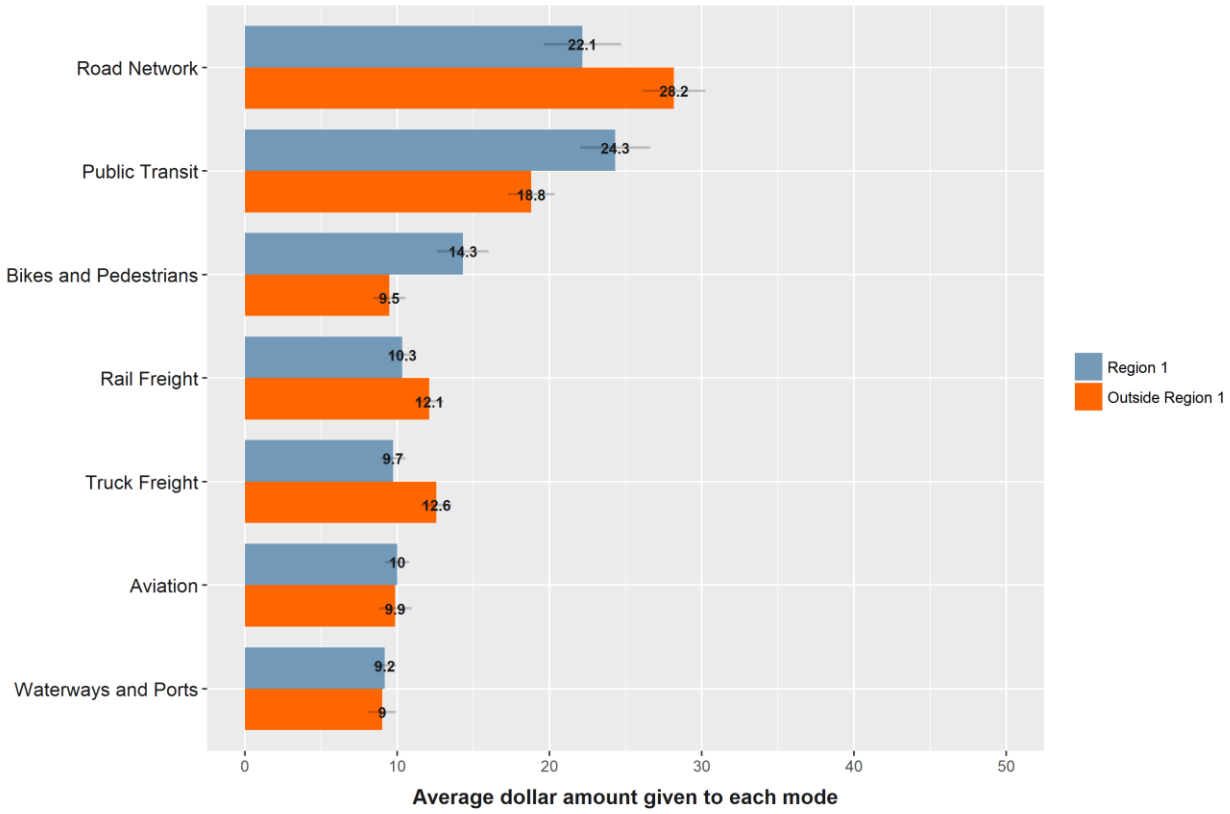


Resident Priorities by Region

Region 1 residents prioritize public transit over road network, giving public transit an average of $24.30. However, road network is a close second priority, as Region 1 residents attribute an average of $22.10 to this mode. The bikes and pedestrians mode receives an average of $14.30, and rail freight receives $10.30. Unlike with Illinois residents overall, Region 1 residents prioritize aviation over truck freight, giving aviation an average of $10 and truck freight an average of $9.70. Waterways and ports receives $9.20, making it the lowest priority mode among Region 1 residents.

Fig. 12: The Illinois Public's Transportation Priorities by IDOT Region

Given $100, the average amount the public gives to each mode based on perceived importance. Grey bars represent confidence intervals.



Residents outside Region 1 give the highest priority to road network at $28.20. The next highest priority is nearly $10 less, with $18.80 being given to public transit. While the bikes and pedestrians mode ranks third most important for both Illinois residents overall and Region 1 residents, it proves to be a low priority for those living outside Region 1. Instead, they identify truck freight and rail freight as the third and fourth most important modes, with truck freight receiving an average of $12.60 and rail freight an average of $12.10. Residents outside Region 1 attribute an average of $9.90 to aviation, $9.50 to bikes and pedestrians and $9 to waterways and ports.

There are evident differences between how residents from the two regions prioritize modes; the greatest differences are with respect to road network, public transit and bikes and pedestrians. The difference between the regions is statistically significant (p-value is below 0.05) for road network, public transit, bikes and pedestrians, rail freight and truck freight.

Figure 13 shows how Region 1 residents distribute $100 across modes based on level of importance. Public transit and road network are given the largest amounts most frequently at 30 percent and 25 percent, respectively. Note that this distribution order flips the order of the

two highest ranked priorities as compared to the rankings of Illinois residents overall. The bikes and pedestrians mode is third with 10 percent of Region 1 residents assigning $30 or more. Less than 3 percent of Region 1 residents give $30 or more to the remaining modes of aviation, rail freight, truck freight and waterways and ports.

Fig. 13: Transportation Modes Priorities for Illinois Residents living within IDOT Region 1 (the Chicago Area)

Given $100, the average amount the public gives to each MODE based on perceived importance

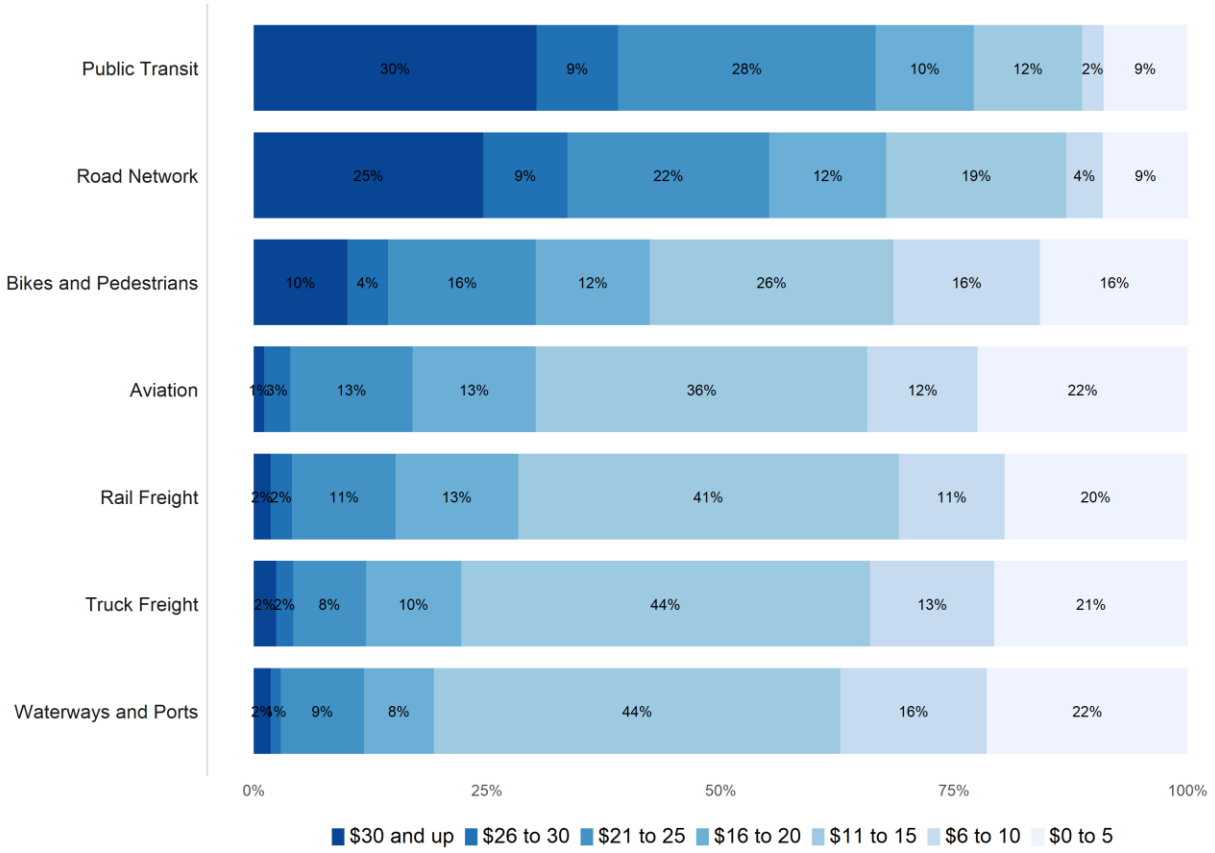
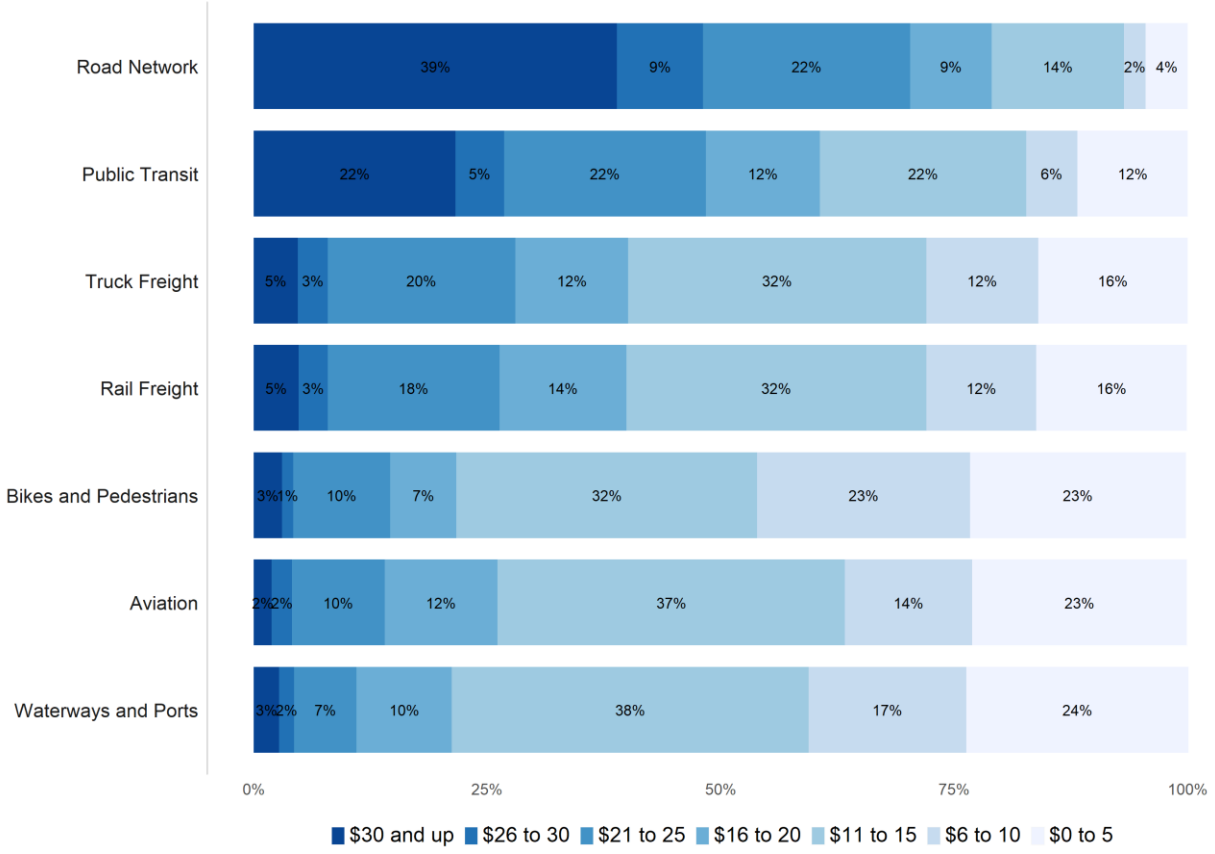


Figure 14 shows the distribution of $100 for residents outside Region 1. With 39 percent giving $30 or more, residents outside Region 1 give the most to the road network mode far more frequently than other mode categories. Public transit ranks second highest with 22 percent assigning more than $30 of their $100 to that mode. The remaining categories of truck freight, rail freight, bikes and pedestrians, aviation and waterways and ports all have 5 percent or less giving $30 or more. It is notable that the last three categories, bikes and pedestrians, aviation and waterways and ports, have large percentages of residents (23 percent or more) assigning $0 to $5 of their $100 allocation to them.

Fig. 14: Transportation Modes Priorities for Illinois Residents living outside of IDOT Region 1

Given $100, the average amount the public gives to each MODE based on perceived importance



Summary

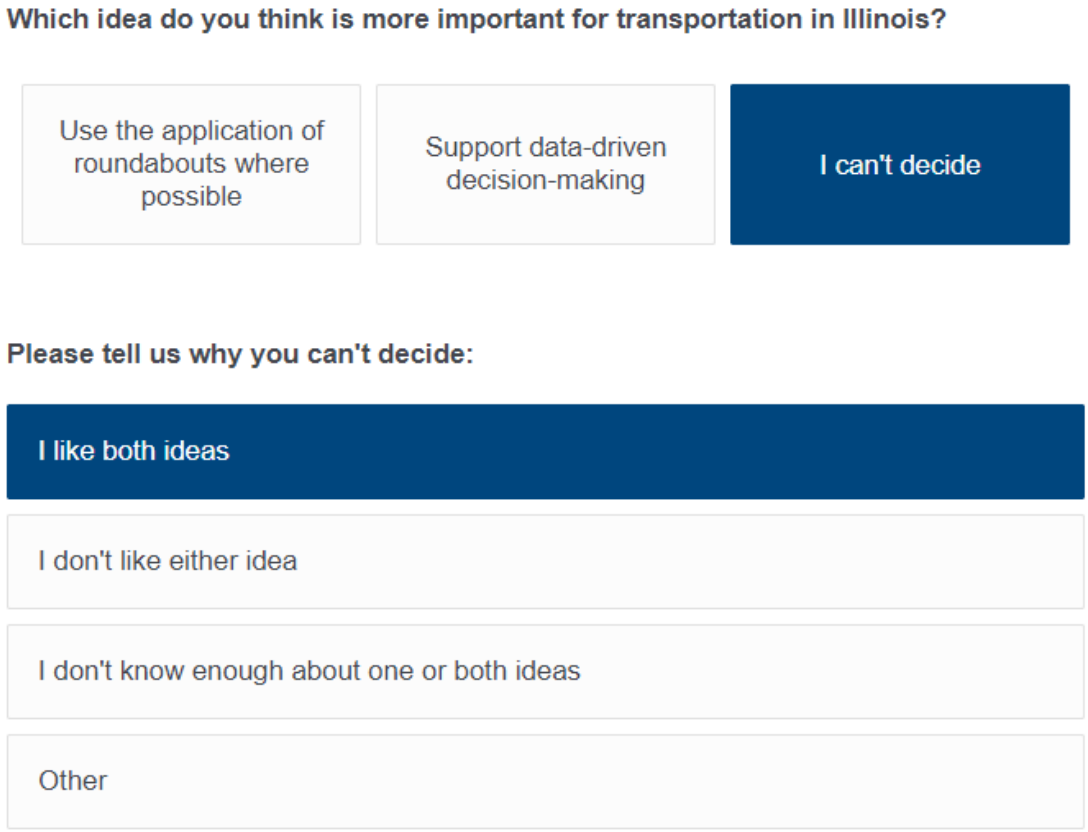
Within modes, the public prioritizes the road network and public transit as most important. For Region 1 residents, public transit is of higher priority, while for residents outside Region 1, road network is a higher priority. The bikes and pedestrians mode is the third highest priority for Region 1 residents; however, for residents outside Region 1, the bikes and pedestrians mode is a low priority and instead truck freight and rail freight were of next highest priority.

There are statistically significant differences between the two regions in how they prioritized road network, public transit, bikes and pedestrians, rail freight and truck freight.

Section 3: Public Prioritization of Transportation Ideas

This section presents findings from the pairwise comparisons completed by the representative YouGov sample.[21] As discussed in more detail in the Methodology section, pairwise comparison is a process by which survey takers choose among two different ideas or a third, "I can't decide," option. In this survey, Illinois residents responded to the question: "Which idea do you think is more important for transportation in Illinois?" (Figure 15) Each of the 1,000 residents completed up to 15 randomly selected pairwise comparisons, which led to 13,370 total matches included in the analysis.[22] The resulting data from these head-to-head match-ups will provide IDOT with unique insights about the transportation ideas and priorities of Illinois residents.

Fig. 15: Questionnaire snapshot. Users who select "I can't decide" see the follow-up question "Please tell us why you can't decide"



[21] Note: this pairwise comparison wiki survey was based on the *All Our Ideas* format, but was hosted on the Qualtrics online survey platform.

[22] Of 15,000 possible pairwise comparisons: 1,000 were excluded because they were part of the data quality check (see footnote 20 on page 17 for more information); 553 were excluded as "I don't know enough about one or both ideas" responses; 77 were excluded as "other" responses or skips; 12,404 were included as a win or a loss; and 966 were included as a tie ("I don't like either idea" or "I like both ideas" responses).

Each idea included in the Phase 2 pairwise comparisons was ranked based on its performance. IPCE ranked the ideas using an Elo rating, rather than a pure winning percentage, because Elo takes into account the strength of an opponent and it allows for the incorporation of ties (in addition to wins and losses) and survey weights.[23] The three tables below show the top 10 highest-rated ideas statewide and within each region. Among these top-performing ideas, there was a relatively even distribution between user-submitted and IDOT seed ideas, with the statewide and Region 1 groups both having five user-submitted ideas in the top 10 and the Outside Region 1 group having four. Table 2 depicts the results for the entire sample of Illinois residents. The Final Score is the likelihood the idea will beat a randomly chosen idea.

Resident Idea Prioritization Statewide

Table 2

Top 10 Ideas - All Illinois Residents	Rank	Final Score	Public Idea?
Increase road repairs that are in desperate need of repair now before creating new highway accesses	1	85	Yes
Invest in streets that enable safe and comfortable travel for users of all abilities and for all modes of transportation	2	84.6	No
Increase the standards that roads are built with to ensure they last	3	83.1	Yes
Invest in long-term material solutions - not patching and short-term asphalt	4	79.2	Yes
Reduce overall costs by performing maintenance before improvements are in critical need of repair	5	78.8	No
Better distribute projects throughout the state to maximize benefits to all regions	6	73.4	No
Reduce vehicle damage due to deteriorated infrastructure	7	73	No
Match transit mode to ridership demand, with all modes on the table including priority bus and light rail	8	72.8	Yes
Invest in construction of major transit improvements	9	72.1	No
Create more visionary long-term plan for transportation assets for all modes and works to ensure Illinois regains its place as USA's crossroad	10	70.9	Yes

The first four ideas of the top 10 ideas, as ranked by the panel representative of all Illinois residents, are explicitly related to road networks. Additionally, Illinois residents express a strong desire for investment in repairs and maintenance. Half of the top 10 ideas directly request more spending on repairs, particularly related to roads, as well as investing in long-lasting materials before infrastructure deteriorates. The top three user-submitted ideas, ranked first, third and fourth, all call for road repairs and investment. Support for large public transit

[23] For more on the Elo calculations in this study, please see Appendix III. Much of the work using Elo ratings in this study is based on: Langville, Amy N. and Meyer, Carl D., "Who's #1: The Science of Rating and Ranking," *Princeton University Press,* Dec. 2013.

investments is also evident in the top 10 ideas, with one highly-rated transit idea submitted by residents (seventh) and one by IDOT (ninth).

Resident Idea Prioritization by Region

IPCE also compared the ten highest-scoring ideas in each region, which are represented in Table 3 (Region 1) and Table 4 (Outside Region 1) below.

Table 3

Top 10 Ideas - Region 1	Rank	Final Score	Public Idea?
Increase the standards that roads are built with to ensure they last	1	87.2	Yes
Invest in streets that enable safe and comfortable travel for users of all abilities and for all modes of transportation	2	86	No
Increase road repairs that are in desperate need of repair now before creating new highway accesses	3	83.3	Yes
Invest in long-term material solutions - not patching and short-term asphalt	4	82.2	Yes
Reduce overall costs by performing maintenance before improvements are in critical need of repair	5	78.5	No
Match transit mode to ridership demand, with all modes on the table including priority bus and light rail	6	74.8	Yes
Plan to quickly alleviate traffic jams due to crashes/fatalities/construction	7	74.7	Yes
Ensure all schools areas are safe for pedestrians and cyclists	8	71.9	No
Provide transit service or increased transit services in areas where viable demand exists	9	71.9	No
Identify rail freight bottlenecks and prioritize rail improvement for reducing highway freight traffic and improving passenger rail	10	70.1	Yes

Table 4

Top 10 Ideas – Outside Region 1	Rank	Final Score	Public Idea?
Increase road repairs that are in desperate need of repair now before creating new highway accesses	1	88	Yes
Better distribute projects throughout the state to maximize benefits to all regions	2	81.8	No
Invest in streets that enable safe and comfortable travel for users of all abilities and for all modes of transportation	3	80.8	No
Reduce overall costs by performing maintenance before improvements are in critical need of repair	4	76.4	No
Increase the standards that roads are built with to ensure they last	5	76	Yes
Invest in construction of major transit improvements	6	75.3	No
Improve capacity and promote congestion relief on road and rail networks	7	74.3	No
Reduce vehicle damage due to deteriorated infrastructure	8	74	No

Create more visionary long-term plan for transportation assets for all modes and works to ensure Illinois regains its place as USA's crossroad	9	73.8	Yes
Be holistic in thinking about repairs and improvements. Savings can be made if all departments work together and are updated on initiatives	10	73.5	Yes

Exploring the differences between the relative performance of ideas in different regions will enable IDOT to glean insights related to how populations in the different regions of Illinois prioritize transportation issues differently. Some observations include:

"Increase road repairs that are in desperate need of repair now before creating new highway accesses" was the top performing idea among all residents in Illinois. It ranked third for Region 1 residents and first for residents outside Region 1. This aligns with broader results, as the top five ideas in both regions and throughout Illinois were all related to roads and/or repairs and maintenance.

"Better distribute projects throughout the state to maximize benefits to all regions" was an IDOT seed idea that was ranked second among residents outside Region 1. It was so popular among these residents that it ranked sixth for Illinois residents overall, despite it placing 17th among Region 1 residents.

Interestingly, public transit appeared explicitly for the first time in the sixth highest-ranked idea for both the residents of Region 1 and the residents outside Region 1. This is perhaps indicative of the value that the majority of Region 1 residents still place on cars, driving and roads, despite the Chicago region's robust public transit network.

Differences in Idea Rankings by Region

Beyond examining the top ten performing ideas in each region, IPCE ranked every idea by Elo score for Region 1 residents and for residents outside Region 1. It then compared the rankings, took the absolute value of the difference and sorted them by largest rank difference. Table 5 lists the 20 ideas with the largest difference in ranking irrespective of which region ranked each idea higher.

Table 5*

Top Ideas by Difference in Rank between Regions	Absolute RANK Difference	Region 1 RANK	Outside Region 1 RANK	Public Idea?
Enhance IDOT's ability to advocate for sound transportation policy and funding	93	114	21	No
Improve road safety by making roads more freight-friendly	77	107	30	No
Improve highway access for rural populations	63	83	20	No
Charge trucks a toll on all expressways if they operate during AM and PM peak hours as a way to reduce congestion	54	60	114	Yes
Make sure new or improved roads don't interfere with residents' way of life	52	67	15	Yes

Support sustainable practices in the delivery of public transportation	49	72	23	No
Safety for cyclists and pedestrians where there are gaps in local networks and/or dangerous conditions	47	33	80	Yes
Make IDOT data publicly available and easy to share	46	75	29	No
Prioritize multiuse trails for walking and biking for transportation and recreation across the state	46	63	109	Yes
Identify gaps in transit service	45	20	65	No
Expand funding for mass transit in Chicago and other urban areas. It's by far the most efficient, cost-effective, and sustainable mode	45	24	69	Yes
Increase rail service access for low-income, elderly, and special needs groups	43	12	55	No
Minimize roadway freight by supporting more waterway and rail freight	42	82	40	Yes
Do more to get high-speed rail built	41	58	99	Yes
Increase rail safety	39	112	73	No
Invest in construction of major rail improvements	39	55	94	No
Enhance connections from public transit to the bike, car, and ride-sharing network	38	28	66	No
Improve transit user experience	38	29	67	No
Improve efficiencies between service providers	37	40	77	No
Plan to quickly alleviate traffic jams due to crashes/fatalities/construction	36	7	43	Yes

*The ideas highlighted in orange indicate that residents from outside Region 1 ranked the idea higher than Region 1 residents.

The three ideas with the greatest disparity are all IDOT seed ideas that residents outside of Region 1 rank much more highly than Region 1 residents. Based on this metric, residents living outside of Region 1 are more concerned with issues related to rural highways, roadway freight, safety and "IDOT's ability to advocate for sound transportation policy and funding," which is the idea with the greatest disparity in rankings. Seventy-five percent of the ideas that residents outside Region 1 value more highly than Region 1 residents are IDOT seed ideas rather than user-submitted ideas.

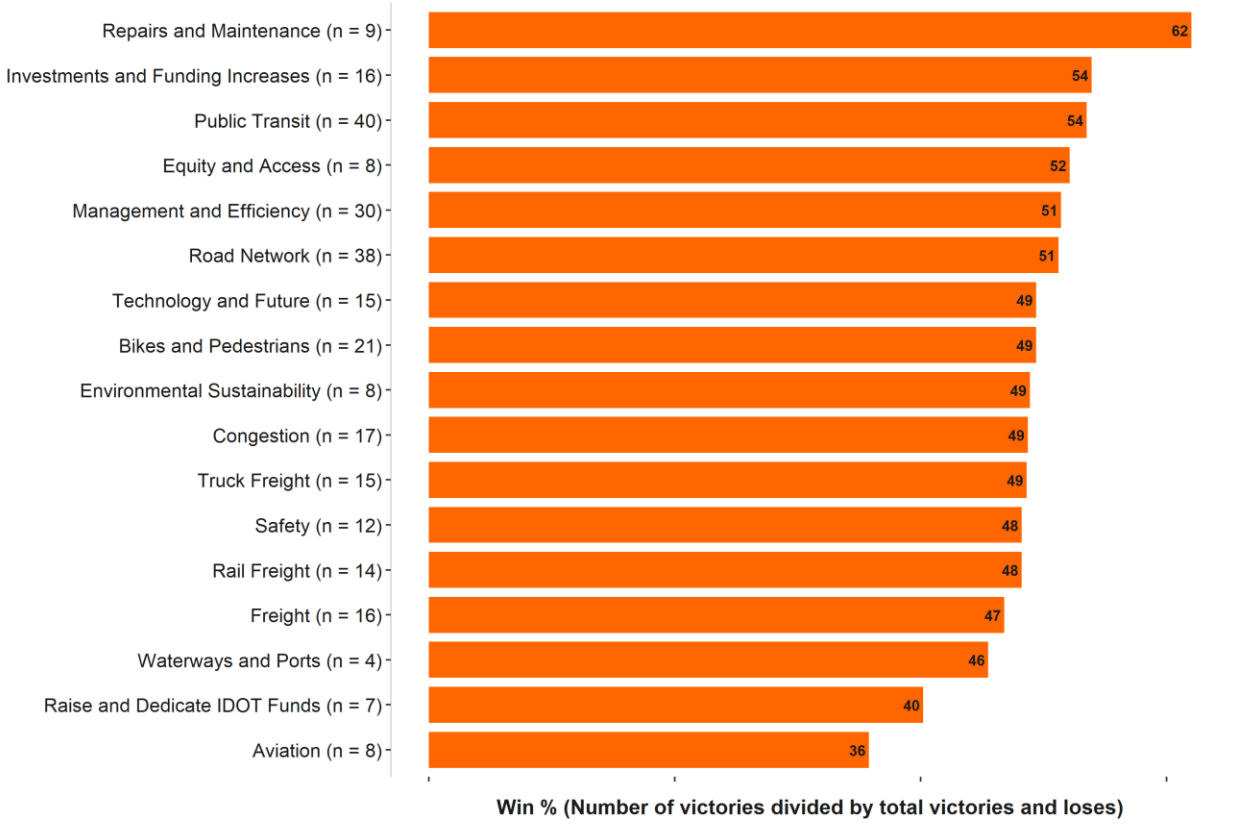
By contrast, 50 percent of the ideas that are more highly-prioritized by Region 1 residents were submitted by users during Phase 1 of this project. Though only one of the ideas in this category mentions freight, it is also the idea with the highest disparity in favor of Region 1. Interestingly, it mentions tolls and reducing congestion in the context of freight, which the residents outside of Region 1 do not address. Most of the ideas that Region 1 residents are more likely to prioritize compared to residents outside Region 1 are related to public transit (buses, trains and rail) and bikes and pedestrians. Finally, Region 1 residents expressed a strong desire for more rapid alleviation of traffic jams; that idea ranked sixth but was less popular for residents outside of Region 1 (43rd).

Priorities Based on Ideas Categorization

In addition to grouping ideas by IDOT's predetermined categories, IPCE also utilized qualitative data analysis software (QDA Miner) to classify ideas into thematic categories. IPCE used two groups of categories to perform data analysis: the modes group as defined by IDOT and an IPCE-created group similar to IDOT's goals, but more comprehensive and inclusive of residents' contributed responses. The winning percentage of each category was then calculated and the results for all Illinois residents are listed below in Figure 16.

Fig. 16: The Types of Transportation Ideas Illinois Residents Think are Important

Percent of the time ideas in different categories win. For example,'Repairs and Maintenance won 62 percent of the time. The 'n' refers to the number of ideas included in the category

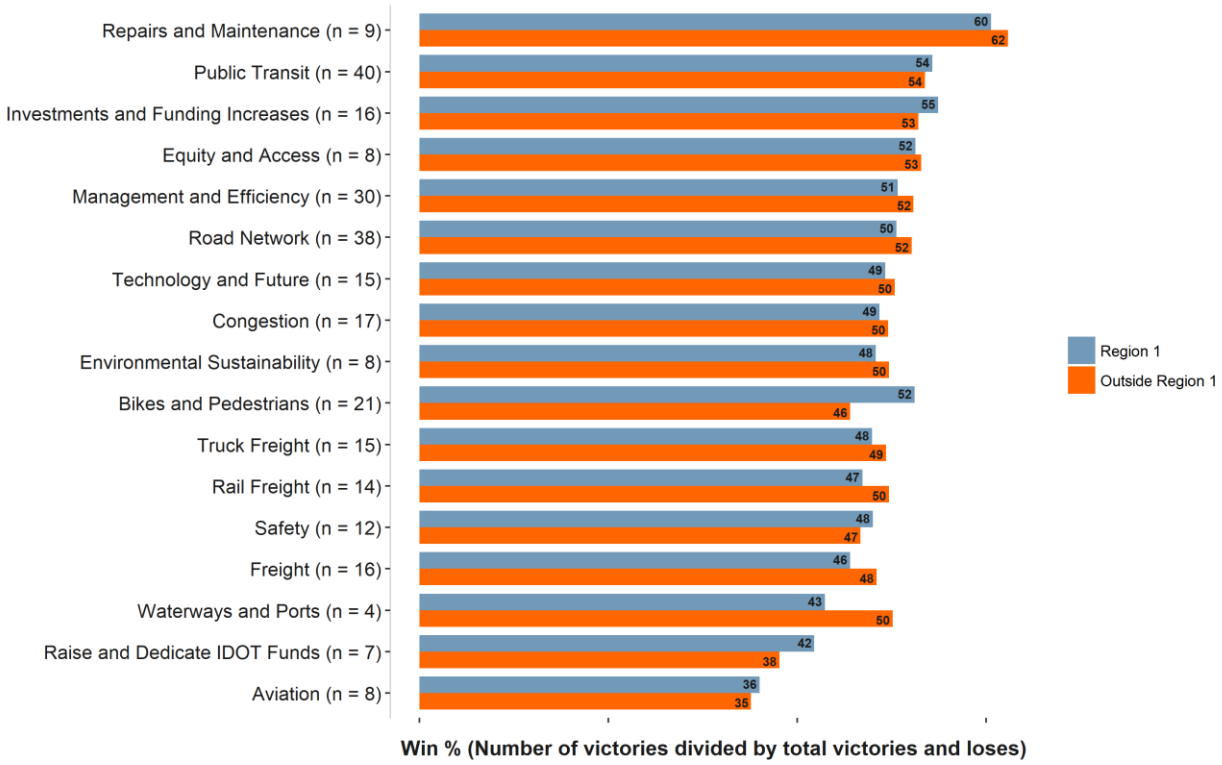


Repairs and maintenance (62 percent) outperforms all other categories by this metric, as it is 8 percentage points higher than the second-place category, whereas the following 13 categories are separated by 8 percentage points. At the other end, aviation-related ideas (36 percent) have the lowest winning percentage of any category. Ideas about public transit (54 percent) are slightly more likely to win as compared to road network (51 percent) ideas, which conflicts with the results of the budget allocation exercise, where Illinois residents allocate more money to the road network than to public transit. Though the investments and funding increase category has the second-highest winning percentage, indicating strong levels of support from the public

for increased transportation spending, the category with the second lowest winning percentage was raise and dedicate IDOT funds. These results are perhaps contradictory, but also not surprising, as the public both recognizes the need for increased infrastructure investment and demands this of public officials but does not approve of increased taxes to fund such spending.

Fig. 17: The Types of Transportation Ideas Illinois Residents Think are Most Important by Region

Percent of the time ideas in different categories win, by IDOT Region. For example,'Waterways and Ports' ideas won 50 percent of the time for residents living outside of IDOT Region 1. The 'n' refers to the number of ideas included in the category



IPCE also ran these calculations for each region as depicted above in Figure 17.
The most notable regional differences in the winning percentages of these categories are related to bikes and pedestrians, as well as freight-related categories. The bikes and pedestrians category is 6 percent more likely to win for Region 1 residents than for residents living outside of Region 1. Conversely, freight-related ideas perform better outside of Region 1 with waterways and ports 7 percent more likely to win in other regions and truck freight, rail freight and freight all performing moderately worse in Region 1, too.

Finally, IPCE examined the ideas that received the greatest number of “I don’t know” votes. The 10 ideas that were involved in pairwise comparisons for which respondents clicked on the “I don't know enough about one or both ideas” button are listed below in Table 6.

Table 6

Top Ten Ideas for which "I Don't Know" was chosen most often	Don't Know	Final Score	Public Idea?
Implement a Transportation Demand Management Program (TDM)	24	38.3	Yes
Support Illinois business by improving access to ports and waterways	22	32.2	No
Increase transparency in project selection	21	40.1	No
Enhance IDOT's ability to advocate for sound transportation policy and funding	20	49.8	No
Leverage aviation infrastructure for economic development	19	32.5	No
Design with physical disabilities in mind	18	50.2	No
Reduce freight congestion	18	42.4	No
Support data-driven decision-making	18	34.1	No
Involve citizens in determining where freight traffic is allowed	17	37	Yes
With the Federal Performance Measures requirements, provide sufficient resources for data collection/management for decision-making	17	36.2	Yes

Notably, though the first idea was submitted by the public, the next 7 ideas with the most "I don't know" votes were IDOT seed ideas. In addition to being the hardest ideas to understand, these ideas also performed poorly overall.

Summary

Road networks and repairs and maintenance are mentioned most frequently in the top 10 highest-ranked ideas for all statewide residents, as well as residents from both regions independently. This is true for both IDOT seed ideas and ideas submitted by the public. Regarding ideas with the greatest disparity in rankings between the regions, residents outside Region 1 are more likely to prioritize issues related to rural highways, roadway freight, safety and "IDOT's ability to advocate for sound transportation policy and funding," which is the idea with the greatest disparity in rankings. Region 1 residents, on the other hand, are more likely to be concerned with issues related to public transit (buses, trains and rail) and bikes and pedestrians.

Finally, in this section, IPCE used qualitative data analysis software to create thematic categories in two groups: IDOT's modes and an IPCE-created group similar to IDOT's goals, but more comprehensive and inclusive of residents' contributed responses. Using this metric, repairs and maintenance is the category with the highest win percentage by a substantial margin. The following categories also had win percentages over 50 percent: investments and funding increases, public transit, equity and access, management and efficiency and road network. These IPCE-created categories perform similarly in both regions other than the bikes and pedestrians category, which is more favored by Region 1 residents and freight-related categories, which are more favored by residents outside Region 1.

Conclusion

As noted in the introduction to this report, IDOT has devoted institutional attention and resources towards improving its public outreach processes. This study serves as a continuation of those efforts and builds on the suggestions outlined in the 2016 *Recommendations to Enhance Quality Engagement* report that IPCE and UTC prepared for IDOT in 2016. In particular, this IPCE engagement process was commissioned to bolster IDOT's efforts to address Recommendation #8 in that report, "Use Technology to Enhance and Complement Outreach."[24]

At IDOT's request, IPCE sought to provide data for the following research questions:

1. To what extent does the public prioritize the transportation goals put forth in the LRTP?
2. To what extent does the public prioritize the transportation modes included in the LRTP?
3. What specific ideas does the public feel are most important for transportation in Illinois?

IPCE utilized an innovative web platform (All Our Ideas) to maximize the amount and quality of feedback that IDOT could generate from an online survey of Illinois' residents. The online survey was structured in two phases and IPCE partnered with YouGov on Phase 2 to create statistically-representative groups of 500 Illinois residents each in two geographic areas of the state: IDOT Region 1 and Outside Region 1. The unique strength of this multi-phased process was its ability to capture high quality ideas from the public and statistically representative public priorities – it was both open and representative.

Upon completion of the data collection process, Illinois residents had provided IDOT with a substantial amount of data that reflect the transportation priorities of the residents of Illinois. The wealth of high-quality, representative data presented in this report allows IDOT to examine Illinois residents' responses in the budget simulation exercises, to compare regional differences among Illinois residents' transportation ideas and priorities and to incorporate the public's feedback into the 2017 LRTP.

Beyond the LRTP planning process, this new methodology for obtaining high quality and representative data from Illinois residents also has exciting potential applications for future IDOT public outreach efforts, both at the statewide and the local level. For example, IPCE removed ideas related to specific locations and projects in order to make each idea applicable to all Illinois residents. On the local level, however, those insightful, publicly-submitted ideas would not only be allowed, but encouraged. Furthermore, IDOT could partner with municipalities, counties and Metropolitan Planning Organizations (MPOs) to conduct regionally-

[24] See: https://utc.uic.edu/eight-recommendations-proposed-to-guide-idot-to-engage-in-more-effective-public-engagement-practices-news-story/

specific, pairwise comparison wiki surveys to generate fresh ideas and local priorities about upcoming projects, discretionary transportation spending and long-term planning efforts.

Finally, this type of public outreach process provides an opportunity to broaden IDOT's reach and engagement with many different populations throughout the state. As one publicly-submitted idea noted, public transportation hearings can occasionally be dominated by the loudest voices in the room, yet those voices don't necessarily speak for all residents in the state. IDOT's continued experimentation and implementation of new outreach methods will enable the department to improve its ongoing engagement with Illinois residents, while elevating the voices and perspectives of residents whose opinions and priorities can be difficult to accurately ascertain through traditional IDOT outreach methods.

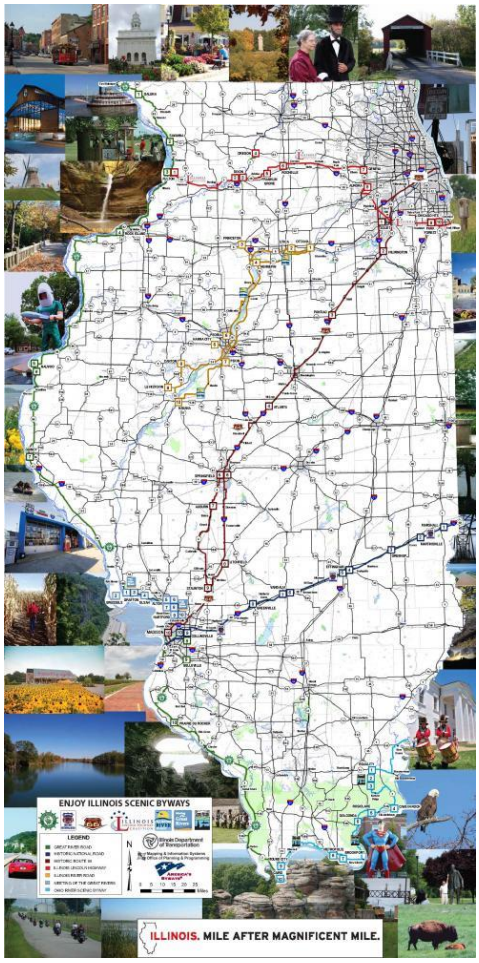
Appendices

APPENDIX I: Survey Questionnaire

Illinois Department of Transportation

The purpose of this survey is to provide Illinoisans an opportunity to tell policy makers how the state transportation system can best meet residents' needs. Illinois has one of the largest, most diverse and most economically vibrant transportation networks in the United States, and its maintenance and modernization are crucial for the state's long-term wellbeing. Your participation in this survey will help the Illinois Department of Transportation (IDOT) formulate strategies that address the needs of Illinois' diverse communities while reflecting shared priorities and making progress toward essential statewide goals.

The results of this survey will inform IDOT's Long Range Plan, which will be completed toward the end of 2017. This plan provides the strategic direction and overarching framework for the development of IDOT budgets and programs.



IDOT's Long Range Plan must address the following goals.

We want to know how important you think these transportation goals are for Illinois.

Q1: Imagine you have $100 to spend on these goals. Please write in the amount you would give to each goal to show how important you think it is. You can give as much or as little as you'd like to each. (**NOTE: Values must add up to 100)**

$____ Economic Growth: Improve Illinois economy by providing transportation infrastructure that allows for the efficient movement of people and goods.
$____ Livability: Enhance quality of life across the state by ensuring that transportation investments advance local goals, provide multimodal options and preserve the environment.
$____ Access: Support all modes of transportation to improve accessibility and safety by improving connections between all modes of transportation.
$____ Resilience: Ensure Illinois' infrastructure is prepared to withstand and sustain hazards and extreme weather events.
$____ Stewardship: Safeguard existing funding and increase revenues to support system maintenance, modernization, and strategic growth of Illinois transportation system.
$____ Safety: Ensure the highest standards in safety across the state transportation system.

IDOT's Long Range Plan must address the following modes of transportation.

We want to know how important you think these modes of transportation are for Illinois.

Q2: Imagine you have $100 to spend on these modes of transportation. Please write in the amount you would give to each mode to show how important you think it is. You can give as much or as little as you'd like to each. **(Note: Values must add up to 100)**

$____ Aviation
$____ Bicycle and Pedestrian
$____ Truck Freight
$____ Rail Freight
$____ Public Transit (Trains and Busses)
$____ Road Network
$____ Waterways and Ports

Q3: How informed, if at all, do you feel about IDOT projects (road repairs, construction) in your area?

(__) Very informed
(__) Somewhat informed
(__) Not very informed
(__) Not at all informed

For the next 15 questions, you will be asked to respond to the same question:

Which idea do you think is more important for transportation in Illinois?

You will be presented with two ideas at a time. Though these ideas may seem unrelated, we ask that you choose the idea that you think is most important for transportation in Illinois. If you cannot decide, choose the option 'I can't decide.'

Note that some of the ideas were created by IDOT staff and some of them were created by the public. May the best ideas win!

Q4 – Q18[25]:

Which idea do you think is more important for transportation in Illinois?

(__) [Randomly chosen idea]
(__) [Another randomly chosen idea]
(__) I can't decide

[Please tell us why you can't decide:

(__) I like both ideas
(__) I don't like either idea
(__) I don't know enough about one or both ideas
(__) Other]

Thank you for taking part in this survey!

For more information about IDOT's Long Range Transportation Plan, visit bit.ly/2hB9akR

[25] Except for Q8 (the fifth pairwise comparison), which was a data quality check. For this question, the left response option was a randomly selected idea, the right idea option stated "Please select this response to show that you are reading through all response options in this survey," and the final option was the 'I can't decide option' that appeared in all pairwise comparisons.

APPENDIX II: List of All Idea Rankings

Table 7

Idea	Final Score All Illinois Residents	Final Score REGION 1	Final Score OUTSIDE REGION 1	Public Idea?
Increase road repairs that are in desperate need of repair now before creating new highway accesses	85	83.3	88	YES
Invest in streets that enable safe and comfortable travel for users of all abilities and for all modes of transportation	84.6	86	80.8	NO
Increase the standards that roads are built with to ensure they last	83.1	87.2	76	YES
Invest in long-term material solutions - not patching and short-term asphalt	79.2	82.2	72.6	YES
Reduce overall costs by performing maintenance before improvements are in critical need of repair	78.8	78.5	76.4	NO
Better distribute projects throughout the state to maximize benefits to all regions	73.4	66	81.8	NO
Reduce vehicle damage due to deteriorated infrastructure	73	69.7	74	NO
Match transit mode to ridership demand, with all modes on the table including priority bus and light rail	72.8	74.8	69.7	YES
Invest in construction of major transit improvements	72.1	68.1	75.3	NO
Create more visionary long-term plan for transportation assets for all modes and works to ensure Illinois regains its place as USA's crossroad	70.9	68.6	73.8	YES
Be holistic in thinking about repairs and improvements. Savings can be made if all departments work together and are updated on initiatives	70.5	68.8	73.5	YES
Improve capacity and promote congestion relief on road and rail networks	69.5	66.5	74.3	NO
Ensure all schools areas are safe for pedestrians and cyclists	69.2	71.9	57.2	NO
Plan to quickly alleviate traffic jams due to crashes/fatalities/construction	68.8	74.7	56.8	YES
Provide transit service or increased transit services in areas where viable demand exists	68.5	71.9	64.4	NO
Identify rail freight bottlenecks and prioritize rail improvement for reducing highway freight traffic and improving passenger rail	66.8	70.1	61.9	YES
Help the state and municipalities secure funds for public transit	65.8	65.5	67.9	NO
Develop projects that support the goals of the state, surrounding community, and users	64.5	63.3	65.9	NO
Support freight transportation projects that create growth and employment opportunities in all regions throughout the state	64.2	65.5	60.4	NO
Improve access to essential destinations such as hospitals and employment centers	64	61.6	70.3	NO
Use construction applications that reduces impacts on the environment	63.4	63	63	YES
Better coordinate with regional transit agencies to improve statewide transportation connections	63.1	55.9	70.1	NO
Increase rail service access for low-income, elderly, and special needs groups	61.7	69.2	52.1	NO
Invest in new traffic and transit technologies	61.6	57.3	66.3	NO
Prepare transportation network for more severe weather conditions	60.9	58.2	62.7	NO
Invest in transportation alternatives for low-income/rural areas	60.6	56.4	68.9	NO
Be consistent in ways that respect both pedestrian and vehicles	60.6	62.2	53.5	YES
Incorporate road improvements for multi-modal transportation in regularly scheduled projects	60.6	57	60.2	YES
Make sure new or improved roads don't interfere with residents' way of life	59.8	50.3	69.5	YES

Idea	Final Score All Illinois Residents	Final Score REGION 1	Final Score OUTSIDE REGION 1	Public Idea?
Prioritize designs and investments that attract more people to take transit instead of driving	59.5	61.8	61.4	YES
Improve reliability, convenience, and efficiency of rail transportation	59.3	58.7	59.3	NO
Expand mass transit along all interstate corridors	59.3	57.4	62.7	YES
Help local governments re-design roads dangerous for walking and biking	58.9	65.1	52.1	YES
Better coordinate with other state transportation departments to efficiently move freight and passenger trains	58.8	55.3	63	NO
State routes that have railroad crossings should have either an overpass or viaduct constructed if feasible	58.6	60.7	54.9	YES
Leverage technology to improve transportation	58.4	57	56.6	NO
Identify gaps in transit service	58	65.3	49.8	NO
Encourage freight traffic to use designated truck routes	57.8	61.1	59.3	YES
Improve coordination and connectivity between transportation service providers	57.7	55.4	59.1	NO
Improve intercity rail passenger service and expand to new markets	57.2	56.9	53.9	YES
Implement best practices to improve return on transit investments	56.9	60	52.9	NO
Build active, ground-level support for transit among residents, businesses, and local leaders	56.8	53.3	61.4	NO
Reduce freight shipments on roads by improving freight connections to rail, water, and air	56.8	53.3	59.3	NO
Increase transit and intercity rail funding	56.8	58.8	53.8	YES
Emphasize environmental sustainability in construction and network expansion	56.5	56.9	54.3	NO
Support highway investment	56.4	52	58.3	NO
Public involvement should consider that the people with the loudest voices don't represent the majority and shouldn't derail projects	56.4	56.6	51.6	YES
Make IDOT data publicly available and easy to share	56.1	47.3	61.7	NO
Expand funding for mass transit in Chicago and other urban areas. It's by far the most efficient, cost-effective, and sustainable mode	55.8	62.4	49.1	YES
Improve transit user experience	55.4	61.5	49.5	NO
Enhance connections from public transit to the bike, car, and ride-sharing network	55.1	61.5	49.5	NO
Emphasize environmental sustainability in design and planning of projects	54.6	49.5	57.2	NO
Replace aging traffic signals with modern equipment	54.3	55.5	54.1	YES
Support sustainable practices in the delivery of public transportation	53.9	48.6	63.1	NO
Design to increase the flow of people and decrease the flow of cars: more commerce, less congestion	53.8	58	52.8	YES
Safety for cyclists and pedestrians where there are gaps in local networks and/or dangerous conditions	53.3	59.5	47.3	YES
Improve efficiencies between service providers	52	57	47.4	NO
Improve highway access for rural populations	52	44.7	65.2	NO
Pass a state budget that includes a more sustainable revenue source for transportation – i.e. update the gas tax	51.9	51	50.2	YES
Reduce congestion by investing in other modes of transportation such as bikes and transit	51.3	54.6	47.9	NO
Price the monetary benefit of reduced roadway congestion provided by transit and increase funding to transit agencies by that amount	51.1	50.6	52	YES

Idea	Final Score All Illinois Residents	Final Score REGION 1	Final Score OUTSIDE REGION 1	Public Idea?
Continue to expand pedestrian and/or bicycle facilities near urban areas to allow multiple user types within public right-of-ways	51	56	50.9	YES
Improve road safety by making roads more freight-friendly	50.7	36.8	61.6	NO
Design with physical disabilities in mind	50.2	48.9	48.9	NO
Use more environmentally friendly practices in right of way management	50.2	55.1	47.4	YES
Improve ability to identify locations that are least safe for pedestrians and cyclists	50.1	54.8	46.9	NO
Minimize roadway freight by supporting more waterway and rail freight	50	44.9	58	YES
Enhance IDOT's ability to advocate for sound transportation policy and funding	49.8	34.4	64.9	NO
Create an app allowing drivers to notify IDOT of needed road repairs	49.6	46.4	53.6	YES
Explore better bike/transit/pedestrian trip counting to help prioritize transportation dollars	48.8	50.8	42.8	YES
Use newer methods of ice removal such as road heating	48.4	45.7	50.1	YES
Invest in construction of major rail improvements	48.3	54.1	42.1	NO
Prevent pedestrian fatalities by improving rail safety	48.1	42.8	52.7	NO
Businesses that bring us all the traffic should be required to pay a good portion of road repairs	48.1	49.1	46.3	YES
Support the development of residential units near transit and rail stations	48	48.2	44.5	NO
Ensure there are adequate airport services provided to the state's largest population and employment centers	47.8	51.4	42.5	NO
Increase funding for transit	47.7	49.1	45.4	YES
Promote the use of new technologies for ride sharing to reduce traffic during peak hours	47.6	53.3	47.4	YES
Improve department efficiency, particularly for minor permits and local agencies	47.5	48.3	45.2	YES
Add acceleration and deceleration lanes for future intersection improvements	47.1	42.3	51.3	YES
Continue work to make inter-city bus stations (Megabus, Greyhound, Trailways, etc) co-located at intermodal rail stations	46.6	46.5	49	YES
Charge trucks a toll on all expressways if they operate during AM and PM peak hours as a way to reduce congestion	46.3	52.3	36	YES
Build a dedicated high-speed rail corridor not using existing rail infrastructure	45.7	45.3	47.6	YES
Articulate strategies for future priorities based on technologies, market, industry, and societal trends - not on dated infrastructure/modes	45.6	42.9	50.4	YES
Ensure airports are respectful of wildlife and surrounding environment	45.5	47.1	38.9	NO
Prioritize multiuse trails for walking and biking for transportation and recreation across the state	44.7	51.3	37	YES
Work with surrounding states to sponsor new passenger rail routes	44.5	41.4	50.4	YES
Improve ability of businesses to connect freight shipments between transportation modes (such as rail to waterways)	44.4	41.4	47.6	NO
The highest ridership transit corridors should have dedicated lanes and signal priority	44.3	42.9	49.4	YES
Adopt pedestrian enhancements	43.5	44.7	38.2	YES
Do more to get high-speed rail built	43.5	53.3	38.8	YES
Increase safety for freight transportation	42.9	39.1	47.7	NO
Increase speed limits on rural interstates to improve traffic flow	42.9	44.7	44.2	YES
Minimize roadway freight	42.6	40.2	46.5	YES

Idea	Final Score All Illinois Residents	Final Score REGION 1	Final Score OUTSIDE REGION 1	Public Idea?
Reduce freight congestion	42.4	39.4	46.8	NO
Make first and last mile easy for people of all abilities	42.2	42.5	45.5	YES
Increase safety for cyclists	42	44.4	38.4	NO
Give local government more design control over roads owned by IDOT	41.3	34.8	44.7	YES
Increase transparency in project selection	40.1	46.9	36.4	NO
Increase rail safety	40	35.4	47.8	NO
Establish rail environmental sustainability programs	39.4	39.5	41.9	NO
Implement a usage tax (miles driven) in lieu of gas tax, so all users (hybrid & electric) contribute to road improvements	39.3	42.8	38.6	YES
Find ways to encourage drivers to drive during non-peak hours	39.2	41	37.1	YES
Improve pedestrian crossing signage and enforcement	39.1	37.1	35.3	YES
Implement a Transportation Demand Management Program (TDM)	38.3	40.5	36.1	YES
Support improvements to rural roads for better bicycle safety/friendliness	37.5	36.3	33.3	YES
Utilize taxes collected on aviation fuel sales to fund a dedicated State/Local Airport Improvement Program	37.5	38.1	38.4	YES
Involve citizens in determining where freight traffic is allowed	37	37.9	34.1	YES
Fund sidewalk and trail development	37	38	37.2	YES
With the Federal Performance Measures requirements, provide sufficient resources for data collection/management for decision-making	36.2	36.4	38.6	YES
Support freight transportation projects that have access to global markets	35.6	34	36.8	NO
Involve stakeholders in transportation planning processes	35.5	32.4	38.5	NO
Enhance airport compliance with state and federal standards	35.3	35.7	44.8	NO
Mark minimum speed limits by lane	35.2	30.5	40.4	YES
Increase aviation safety	34.5	37.8	31.8	NO
Support data-driven decision-making	34.1	32.2	40	NO
Install more electronic message boards statewide to communicate travel times to motorists	33	30.8	29.4	YES
Leverage aviation infrastructure for economic development	32.5	33.7	32	NO
Utilize green space to create pollinator gardens	32.4	36.3	34	YES
Support Illinois business by improving access to ports and waterways	32.2	29.8	38.1	NO
Identify and plan public-private partnership opportunities	31.8	27.8	35.3	NO
Adopt drones for infrastructure maintenance and traffic accident investigations to reduce time and costs	31.5	32.2	33.2	YES
Convert an existing lane to a priced lane to test demand before adding new lanes	31.4	41.1	23.9	YES
The amount of space devoted to parking should decline as a city becomes more dense and populous to encourage transit and reduce congestion	31.4	30.5	28.8	YES
Embrace and plan for the coming of autonomous vehicles	31.3	32.2	34.8	YES
Increase bike safety	30.3	29.3	30.4	NO
Support a connected, statewide bike network	29.4	34.2	25.3	NO
Use the application of roundabouts where possible	29.4	24.9	36.7	YES
Decrease regulatory burdens on freight movement	27.9	32.5	22	YES

Idea	Final Score All Illinois Residents	Final Score REGION 1	Final Score OUTSIDE REGION 1	Public Idea?
Invest in airport improvements	27.8	27.1	26.7	NO
Improve airport access for rural populations	26.1	25	28.2	NO
Gather appropriate funding by raising the gas tax for all personal vehicle drivers on the road	24.2	33.7	17.1	YES
Increase no passing zones on rural state routes	21.1	22.8	21.7	YES
Support increased user fees for transportation	17.6	16.3	18	YES

APPENDIX III: R Programming Package Citations

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APPENDIX IV: The Elo Rating Method

For this study, the Elo rating method ranks the 134 ideas included in the survey based on the set of 13,370 pairwise comparisons (matches) completed by the respondents. The Elo rating method was used because its formula includes a mechanism for incorporating ties and survey weights, and because the final scores take into account the strength of opponent, meaning that it "rewards a weaker player for defeating a stronger player to a greater degree than it rewards a stronger player for beating a weaker opponent."[26]

The Elo Formula

r(old) = current Elo score (before the match)
K = a constant that affects how many points each player can win or loss at each match. A larger K means that more points may be won/lost.
i = refers to idea i. So, $r_i\,(old)$ = the current Elo score for idea i
j = refers to idea j
d_{ij} = the difference in Elo scores between i and j. So, $d_{ij} = r_i\,(old) - r_j\,(old)$
μ_{ij} = the number of points that idea i is expected to score against idea j. This assumes that μ_{ij} is a logistic function of the difference in ratings such that $\mu_{ij} = 1 / (1 + 10^{-d_{ij}/400})$. For example, if idea i has the current Elo score of 100 and idea j has the current Elo score of 20, $\mu_{ij} = 1 / (1 + 10^{-80/400}) = .61$. This means that idea i is expected to win .61 points, i.e. has a 61 percent chance of winning.
S_{ij} = result of the match (1 = i beats j, .5 = tie, 0 = j beats i)
r(new) = updated Elo score (after the match). For i, $r_i\,(new) = r_i\,(old) + K(S_{ij} - \mu_{ij})$. For j, $r_j\,(new) = r_i\,(old) + K(S_{ji} - \mu_{ji})$.

For example, if $r_i\,(old)$ = 200 and $r_i\,(old)$ = 300, S_{ij} = 1 (meaning that idea i beats idea j), and we set the K value to 40, then the new score for idea is:

$r_i\,(new) = r_i\,(old) + K(S_{ij} - \mu_{ij})$
$r_i\,(new) = 200 + 40(1 - (1 / (1 + 10^{100/400})))$
$r_i\,(new) = 200 + 40(1 - .36)$
$r_i\,(new) = 200 + 26$
$r_i\,(new) = 226$

AND the new score for idea j is:

$r_j\,(new) = r_i\,(old) + K(S_{ji} - \mu_{ji})$
$r_j\,(new) = 300 + 40(0 - (1 / (1 + 10^{-100/400})))$
$r_j\,(new) = 300 + 40(0 - .36)$
$r_j\,(new) = 300 - 26$
$r_j\,(new) = 274$

[26] Langville, Amy N. and Meyer, Carl D., "Who's #1: The Science of Rating and Ranking," *Princeton University Press,* Dec. 2013, p. 55.

Tuning the K value and incorporating weights

The K value used in this study is K = 40, which is the value that minimized squared error (which is the square of the difference between the predicted S and actual S).

A beneficial feature of the Elo method is that it has a "built-in mechanism for weighting"[27] via the K value. In order to incorporate the survey weights, the following adjustment was made to the Elo formula presented above:

w = weight. This is the survey weight associated with the respondent for each match.
$K = 40 * w$

For example, if respondent z has a survey weight of 2.4, then all matches for this respondent have $K_z = 40 * w_z = 40 * 2.4 = 96$. Since the survey weights for all respondents average to 1, the K value averages to 40.

Calculating the Final Elo Scores for each idea

The raw order of matches is chronological based on the time when each respondent responded to the survey. Unlike the use of Elo in other applications where time matters, in this case it does not, and in fact, cases where an idea happen to win or lose a high percentage of its final games are problematic as the idea's ending score is likely not representative of its true strength. In order to address this issue, the order of matches was randomized 500 times, and the average final Elo score for each of the 500 tournaments was used to create the Final Score for each idea. To improve the accuracy of the scores, starting with tournament #2 the rolling average of final tournament scores was used as the starting score for each idea.

Tournament #1:
Step 1: The starting Elo scores for all 134 ideas are set to 0.
Step 2: Randomize the order of all 13,370 matches.
Step 3: Calculate updated Elo scores for all 134 ideas based on the results of the 13,370 matches.
Step 4: Record the final tournament Elo scores for all 134 ideas.

Tournaments #2 through #500:
Step 1: The starting Elo score for each of the 134 ideas is set to its current average final tournament Elo score. For example, if idea i has final tournament Elo scores of 132, 80, 120 and 62 for tournaments #1, 2, 3 and 4 (respectively), then it's current average final tournament Elo

[27] Ibid, p. 150

score is (132 + 80 + 120 + 62) / 4 = 98.5. Accordingly, for tournament #5 idea i will have a starting Elo score of 98.5.
Step 2: Randomize the order of all 13,370 matches.
Step 3: Calculate updated Elo scores for all 134 ideas based on the results of the 13,370 matches.
Step 4: Record the final tournament Elo scores for all 134 ideas.

The Final Elo Score for each idea is its average final tournament Elo score for all 500 tournaments.

Converting the Final Elo Score to Final Score (it's win probability)

As stated on the first page of this appendix, μ_{ij} is the number of points that idea i is expected to score against idea j -- this assumes that μ_{ij} is a logistic function of the difference in ratings such that $\mu_{ij} = 1 / (1 + 10^{-d_{ij}/400})$.

In order to convert Final Elo Scores for each idea into a more interpretable measure of strength, for each idea we take the average number of points that the idea is expected to win against all other ideas, based on all of the other ideas' Final Elo Score. This gives us the average win probability for each idea against all other ideas.

For example, let's say we have 5 ideas i, j, k, l and m – and we want to calculate the average win probability for idea i against the other 4 ideas, and we have the following Final Elo Scores for each idea:

$r_i(final) = 230$
$r_j(final) = 100$
$r_k(final) = 30$
$r_l(final) = -20$
$r_m(final) = 400$

First, we calculate the expected number of points idea i will win in each matchup:
$\mu_{ij} = 1 / (1 + 10^{-130/400}) = .68$
$\mu_{ik} = 1 / (1 + 10^{-200/400}) = .76$
$\mu_{il} = 1 / (1 + 10^{-250/400}) = .81$
$\mu_{im} = 1 / (1 + 10^{170/400}) = .27$

Then, we average these to get the average win probability against these four ideas:

(.68 + .76 + .81 + .27) / 4 = .63

Appendix V: Criteria for Excluding Publicly-Submitted Ideas in Phase 1

Exclusion Criteria Definitions	Number of Exclusions
Entry is a comment rather than an idea for improving transportation	108
Scope of idea is too narrow or specific, meaning that not all Illinois residents can evaluate it	60
Idea contains information that would compromise user privacy	1
Idea suggests action outside of IDOT's authority	2
Idea was rewritten and resubmitted to account for faulty grammar or the inclusion of two separate ideas	8
Idea contained offensive content	1
Idea is a repeat of previous entry by same user	1
Idea is imprecise or otherwise incomprehensible	3
Idea is a repeat of previous entry	32

Appendix VI: Outcome Rate Information for Phase 2 provided by YouGov

Table of AAPOR Outcome Rates

	Counties	Rest of State
Interview (Category 1)		
Complete	741	599
Partial	106	103
Eligible, non-interview (Category 2)		
Refusal	0	0
Unknown eligibility, non-interview (Category 3)		
No answer	1671	1069
Not eligible (Category 4)		
Out of sample – other strata than originally coded	456	162
Total email addresses used	2974	1933
I=Complete Interviews (1.1)	741	599
P=Partial Interviews (1.2)	106	103
R=Refusal and breakoff (2.1)	0	0
NC=Non Contact (2.2)	0	0
O=Other (2.0, 2.3)	0	0
Estimate of e is based on proportion of eligible households among all numbers for which a definitive determination of status was obtained (a very conservative estimate). This will be used if you do not enter a different estimate in line 62.	0.650	0.813
UH=Unknown household (3.1)	1671	1069
UO=Unknown other (3.2, 3.9)	0	0
Response Rate 1		
I/(I+P) + (R+NC+O) + (UH+UO)	0.294	0.338
Response Rate 2		
(I+P)/(I+P) + (R+NC+O) + (UH+UO)	0.336	0.396
Response Rate 3		
I/((I+P) + (R+NC+O) + e(UH+UO))	0.383	0.381
Response Rate 4		
(I+P)/((I+P) + (R+NC+O) + e(UH+UO))	0.438	0.447

Cooperation Rate 1		
I/(I+P)+R+O)	0.875	0.853
Cooperation Rate 2		
(I+P)/((I+P)+R+O))	1.000	1.000
Cooperation Rate 3		
I/((I+P)+R))	0.875	0.853
Cooperation Rate 4		
(I+P)/((I+P)+R))	1.000	1.000
Refusal Rate 1		
R/((I+P)+(R+NC+O) + UH + UO))	0.000	0.000
Refusal Rate 2		
R/((I+P)+(R+NC+O) + e(UH + UO))	0.000	0.000
Refusal Rate 3		
R/((I+P)+(R+NC+O))	0.000	0.000
Contact Rate 1		
(I+P)+R+O / (I+P)+R+O+NC+ (UH + UO)	0.336	0.396
Contact Rate 2		
(I+P)+R+O / (I+P)+R+O+NC + e(UH+UO)	0.438	0.447
Contact Rate 3		
(I+P)+R+O / (I+P)+R+O+NC	1.000	1.000