



**ASCE**  
**BLUE SKY COMPETITION**  
**2020 Rules**

**Smart Mobility for Smart Cities: Transforming the Way We Live**

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## Section 1: Mission and Summary

The field of civil engineering is changing at an extraordinary rate due to a number of large-scale and impactful disruptors, including rapid advances in technology and major stressors facing the world and, subsequently, the built environment. The American Society of Civil Engineers (ASCE) Student Competitions, and the students who participate in them, have an opportunity to address these disruptors by providing ideas and solutions to innovatively address “wicked” problems, existing now or that could exist in the future. Some examples of identified problems are shown in the National Academy of Engineering (NAE) Grand Challenges, ASCE Innovation Contest topics, ASCE Vision 2025, or United Nations (UN) Sustainable Development Goals. Visionary thinking is necessary to develop ideas and solutions which are timely, engaging, innovative, exciting, and beneficial to society. Students can play an important role in the development of these solutions through their education and involvement with ASCE Student Competitions such as the Blue Sky Competition.

This year the Blue Sky Competition theme is **Smart Mobility for Smart Cities: Transforming the Way We Live**. The competition will identify visionary solutions to address engineering challenges in the area of transportation and development. Teams are expected to be approached as a student-led effort and may include interdisciplinary collaborations. The competition will be judged by a panel of industry and education experts. Solutions that can be described as “radical”, “out-of-the-box”, “transformational”, “unconventional”, or “breakthrough” are encouraged. The proposed solutions should be carefully thought out and carried out as a student team effort with a feasible work plan and should be presented through various types of deliverables. The use of advanced technologies, including those from disciplines outside of engineering such as digital design tools and virtual representations are welcome to illustrate the proposed ideas via these deliverables.

Blue Sky initiatives are commonly intended to bring together interested people to seek out visionary ideas which can be used to stimulate communities and fields, pursue new directions, or address “wicked” problems. Those who participate in these activities are unconstrained in their efforts so revolutionary thoughts are developed, presented, and used to stimulate new activities and directions in areas of interest.

***Your challenge, should you choose to accept it, is to chart the future of Smart Mobility for Smart Cities!***

## Section 2: Problem Statement

Mobility has been an important motor for growth and progress of our society since ancient times, and it has consistently challenged and transformed the way we live. Mobility in transportation is multi-faceted and covers air transportation, ground/underground transportation, maritime transportation, or even pipeline (gas, oil) transportation. It has a wide impact on our lives, in terms of transportation safety, urban traffic congestion and travel reliability, accessibility, fuel consumption and air pollution, weather emergency and natural disaster response, and even global warming. With the fast increase of vehicles on the road and vehicle miles traveled (VMT), it is estimated that approximately 35,000 people are killed

in the US and overall 1.35 million people are killed in the world in traffic incidents each year, according to National Highway Traffic Safety Administration (NHTSA) and World Health Organization (WHO).<sup>1,2</sup> Meanwhile, traffic congestion in the U.S. cost \$87 billion in lost productivity in 2018 or \$1,348 per driver.<sup>3</sup> On the other hand, considerable rural populations still lack reliable access to markets and services available in urban areas. Excessive fuel consumption from transportation releases tremendous amount of CO<sub>2</sub> and pollutant particles in the air, contributing significantly to air pollution and global warming. These challenges and their consequences will become more severe if we don't respond by curbing current mobility trends in a smart way.

With the advancement of information and communication technologies (ICTs), such as 5G communications, connected and autonomous vehicles, digital design tools, virtual reality, artificial intelligence, etc., mobility is not just a matter of movement of passengers and cargo within a localized geographical region, but has become a complex world-wide issue that has been integrated into our lives and calls for collaborative, smart and integrated solutions. "Smart mobility" is an integral component of the "smart city" concept, and it is acknowledged that smart mobility in transportation should integrate ICTs in the transportation system to improve the serviceability, efficiency and performance of the system.<sup>4</sup> Since smart mobility is such a comprehensive concept and is closely associated with transportation safety, accessibility, operation efficiency, economic feasibility, and environmental and societal sustainability, there are countless issues challenging us and calling for "smart" solutions that will transform the way we travel and live.

The competition theme **Smart Mobility for Smart Cities: Transforming the Way We Live** represents our vision for exploring smart mobility solutions to the transportation and development challenges we are facing today and tomorrow. We are challenging you to identify a current or future-emerging transportation issue and propose your "smart" solutions to the identified issue to improve the mobility and operation efficiency of the transportation network. The topics of choices are unconstrained, and your solutions are encouraged to be "transformational" and "breakthrough"!

Examples of questions your solution could address might include what can we do to reduce traffic crashes and fatalities, alleviate urban congestion and excessive fuel consumption, increase accessibility to high-quality services, minimize flight delays and lost cargo, combat human error, or cope with environmental issues, and therefore transform the way we live. A few representative examples to spark your imagination are listed below, but they are only the beginning:

- How do you safely, quickly and efficiently disperse a crowd following a major sporting event or catastrophic natural disaster in a smart city? *For instance, a smart city will be impacted by a major hurricane in five days. Given the height of the water table, all transportation within the city is via smart platooning of surface vehicles (buses, commercial, personal, etc.) using 5G. It is expected that power to the city will be cut off in 60 hours and the mayor has ordered that all vulnerable residents must be evacuated to a neighboring city 80 miles away. As the city*

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<sup>1</sup> Fatality Analysis Reporting System (FARS), NHTSA. Available at: <https://www-fars.nhtsa.dot.gov/People/PeopleAllVictims.aspx>

<sup>2</sup> Global Health Observatory (GHO) data: Road Safety, WHO. Available at: [https://www.who.int/gho/road\\_safety/en/](https://www.who.int/gho/road_safety/en/)

<sup>3</sup> 2018 Global Traffic Score Card, INRIX. Available at: <http://inrix.com/scorecard/>.

<sup>4</sup> Smart City Challenge: Lessons for Building Cities of the Future, USDOT. Available at: <https://www.transportation.gov/policy-initiatives/smartcity/smart-city-challenge-lessons-building-cities-future>

*transportation engineer, how will you successfully inform and safely evacuate 100,000 people to another city 80 miles away utilizing technology and the existing roadway network?*

- How do you identify the nearest medical emergency facilities and plan the optimal route after a critical traffic incident with injuries, given existing road and traffic condition? *For instance, a multi-vehicle crash occurred on a city local road and two occupants were critically injured. As a city transportation engineer, a few steps need to be done. First, you need to plan the shortest route (in time) for Emergency Medical Services (EMS) and dispatch them to the crash scene. Second, although emergency treatments have been applied, these victims need immediate surgery at the nearest hospital. You then need to identify the nearest hospital and plan the shortest route in time for the EMS vehicles. In the meantime, the hospital needs to be alerted and surgery staff needs to prepare. Using ITS technologies and big data techniques, how could we improve existing EMS service by linking the transportation management center (TMC), EMS, and city hospital databases, and integrating roadway network, traffic volume and delay, crash location, and hospital location information into the decision-making process?*
- How do you use auto-robotic technology to improve cargo packaging and stowage and reduce damage during the shipping process? *For instance, when using air travel, especially for multiple days, we often have to check our luggage/suitcases. Due to variance in size and weight of our luggage, human effort is needed to load/unload them, and sometimes damage occurs to the suitcase or the items in the suitcase, either due to the loading/unloading process or due to en-route turbulence. One of the feasible alternatives might be applying standardized packaging and stowage, in which the luggage could be properly protected and compactly stowed. The TEU (twenty-foot equivalent unit) concept for shipment volume provides a good example, where maritime cargos are packaged into 20-foot-long containers and these containers could be aligned and organized on ships. How could you design a luggage “package” standardization process and use auto-robotic technology to “streamline” packaging and the stowage process in order to minimize the potential of damage?*
- And more.....

You are strongly encouraged to develop your original ideas and use advanced technologies, including those from disciplines inside and outside of engineering, such as ICTs listed above, to illustrate your “transformational” and “breakthrough” solutions. The future of transportation is within your imagination and creation!

***You are the inventors, innovators, and imagineers - what will YOUR smart mobility solution be, how will YOU make it happen, how will YOU ensure it adheres to appropriate societal and engineering ethics, and how will it change the way we live?***

### Section 3: Ethics

This competition is to be conducted in the highest ethical standard. Students are referred to ASCE’s Code of Ethics ( <https://www.asce.org/ethics/>), which sets the standards of professional practice by all members of the Society. According to the ASCE Code of Ethics, Canon 5, “Engineers shall build their professional reputation on the merit of their services and shall not compete unfairly with others”.

In the context of this contest, “unfair competition” may include conduct such as the following:

- Failure to provide proper credit for past teams, plagiarism, or any other false statements concerning the source of material used in the contest;
- Taking other people’s ideas, artwork, or other creative content without permission (for an overview of Intellectual Property Laws, including Trademark and Copyright, visit <https://fairuse.stanford.edu/overview/introduction/intellectual-property-laws/>); and
- Any false or malicious statements about other teams, members, or others involved in the contest.

The rules are intended to simulate creative future-looking smart mobility. Students and teams should read these rules thoroughly and seek clarifications as necessary. The rules are intended to enable the student teams to be innovative in the development of their proposed smart mobility solution. They are intended to be prescriptive but may require interpretation. This document, also available on the ASCE Student Competitions page of the ASCE Website, defines the 2020 Blue Sky Competition and the rules for both the conference and society wide levels. Requests for Information (RFI) should be sent to [Student@ASCE.Org](mailto:Student@ASCE.Org). Clarifications will be posted to the Blue Sky Collaborate site (<https://collaborate.asce.org/communities/community-home?CommunityKey=c874e311-52af-4e00-bdd1-024b2448d196>) on every other Friday, starting September 20, 2019 until February 7, 2020. Each post will address the questions received from the previous two weeks through the Wednesday before (11:59 pm EST).

## Section 4: Eligibility

Only one entry per college or university may compete in the ASCE Blue Sky Competition. A college or university may compete in only one ASCE student conference. The teams, representing an ASCE student chapter in good standing, shall be led by undergraduate students and may be advised by graduate students. Students must be in good standing with their ASCE student chapter and be Society level ASCE student members during all or part of the fall through spring of the current competition academic year. ASCE student chapters hosting conferences can invite teams from colleges or universities that do not have ASCE student chapters or from ASCE student chapters assigned to different conferences. Conference assignments are listed in the ASCE Official Register at <https://www.asce.org/official-register/>, and conference host chapters are listed at [www.asce.org/studentconferences](http://www.asce.org/studentconferences).

### 4.1. Levels of Competition

There are two levels of competition: ASCE annual student conferences and a Society-wide Finals level. The Society-wide Finals level will be conducted at a common location in conjunction with other Society-wide Finals student competitions.

### 4.2. Required Conduct and Advancement to Society-wide Competition

All participants shall act professionally and respectfully at all times. Failure to act appropriately can result in sanctions, disqualification, and loss of invitations to future competitions or Society-wide competitions. The inappropriate use of language, alcohol, materials, uncooperativeness, or general unprofessional or unethical behavior will not be tolerated.

Winning teams from the student conferences may be invited to a Society-wide Finals event to present their solutions.

To advance to Society-wide competition, teams must meet ASCE eligibility standards:

[https://www.asce.org/eligibility\\_for\\_national\\_competitions/](https://www.asce.org/eligibility_for_national_competitions/)

The student conference host student chapter shall promptly submit the completed official scoring spreadsheet for a conference competition to [Student@ASCE.Org](mailto:Student@ASCE.Org). Teams will not be invited to Society-wide Finals event until this spreadsheet is received and eligibility is confirmed.

## Section 5: Safety

Safety is the highest priority and risk of personal injury will not be tolerated. Judges are empowered to stop and prohibit any activity which is deemed to be hazardous.

Students should use safe practices in any competition test events, proof of concept exercises, or any activities associated with ideas and exercises related to their competition entries and should seek appropriate instruction and supervision as necessary to maintain health and safety.

## Section 6: Judging

The host student chapter will recruit judges, three to five are recommended. The judging panel should include educators and professionals, and individuals with knowledge of transportation and development, ideally some will be members of the ASCE Transportation & Development Institute (T&DI). Judges have authority over conduct of the competition as well as interpretation of the rules. The host chapter will ensure all judges are fully informed of the rules and procedures and are fully equipped to complete their tasks.

The students are encouraged to use innovative and broad-based ideas in the development and portrayal of the proposed solution. Judging should consider the innovative nature and completeness of the presentation of the ideas.

## Section 7: Scoring

This competition relies heavily on **YOUR** ability to present an original, innovative smart mobility solution in a clear, professional, engaging, and persuasive manner. Scoring will be based, not only on the proposed solution, but also on **YOUR** approach to presenting **YOUR** solution to the panel. As with any professional proposal, you control the message you want to convey.

### 7.1. Recording Data and Submitting Scores

Scoring data shall be recorded for each team which competes. Official judging forms shall be used which will be provided by February 1, 2020 to student conference host schools. The information from the judge's data sheets are entered into a spreadsheet which tabulates the official results of the competition. Judges data forms shall be retained by the host student chapter for two weeks after the competition.

## 7.2. Categories of Competition

Categories of the competition shall be overall submission, written proposal, oral presentation, and poster presentation. These categories will go into the evaluation for the best submission.

## 7.3. Overall submission

The overall submission (written proposal, oral presentation, and poster presentation) will be judged on the following elements.

### 7.3.1. Creativity and Innovation

The complete submission will be judged for creativity and innovation. This will be judged on this criterion in reference to the ideas behind the proposed smart mobility solution.

### 7.3.2. Ability to Address a Societal Need

The proposed smart mobility solutions will be judged on its ability to address a “wicked” transportation mobility issue, other societal challenges, or needs related to transportation and development. Ideas should be linked to the focus of the ASCE T&DI (<https://www.asce.org/transportation-and-development-engineering/transportation-and-development/>).

### 7.3.3. Appeal to the Public

The proposed transportation issue and “smart” solution should have wide appeal to the public. Proposed solutions should be creative, future looking and visionary, and provide a “wow” factor. To demonstrate appeal, entries may share results of testing, surveying, demonstrations, proof of concept, research, etc.

## 7.4. Written Proposal

The proposal of the smart mobility solution will be judged for its thoroughness and completeness as it describes and explains the identified transportation issue and the proposed “smart” solution to address the issue. The proposal must contain the following elements:

- Executive Summary;
- Table of Contents;
- Background and problem statement for the identified issue;
- Explanation of how the proposed smart solution could address the identified issue as well as any applicable other societal challenges or needs related to transportation and development;
- Discussion of how this proposed smart mobility solution takes advantage of modern technology;
- Discussion of how it will appeal to the public—share results of any testing, surveying, demonstrations, proof of concept, research etc., that was done or found to address this;
- Discussion of resources required to enact this solution (this can be general in nature, or more specific and include cost estimates);
- Anticipated engineering and societal value of the proposed solution, and
- References.

This written proposal is an opportunity for the team to demonstrate the thought process used for the development of their proposed smart mobility solution. Teams are encouraged to use the written

proposal to completely discuss any aspects of their proposed smart mobility solution which address the problem statement and goals of the competition.

The body and appendices of the written proposal shall be presented on white 8 ½ in. by 11 in. pages in portrait orientation. No background images or watermarks are permitted behind the text in the body or appendices of the paper. Appendix (if used) cover sheets are permitted but are not required. No blank pages shall be inserted into the proposal. All pages of the proposal and appendices shall maintain a minimum of ½ in. margins on all sides.

Body text shall be in English and use 12-point, normal width character spacing, Times New Roman or Calibri font, and be single spaced. Section headings and subheadings may be of any legible font type or size. The hard copy of the proposal shall consist of a single-sided cover, single-sided pages for the body and appendices (if used), and a back cover.

Body pages, except for the Table of Contents and Executive Summary, shall be numbered beginning with the number one (1). The body text should be no more than 15 pages. The Table of Contents and Executive Summary shall be numbered with lowercase Roman numerals i and ii, respectively. Pages located in the appendices shall be numbered in such a way that the appendix and page number are clearly listed (e.g., A-1, A-2, B-1, B-2; A1, A2, B1, B2; etc.) as appropriate.

Captions for figures and tables shall be used and shall be no less than 10-point, normal width, and any legible font type. Items such as page numbers, logos, images/designs, section headings, etc. may be incorporated into the header and footer of the pages and are not subject to the font requirements of the body text. The header and footer may be located within the margin itself (i.e., outside of the body text limits). Public sources of information in support of the proposed solution should be referenced appropriately in the body text. Consistent with ASCE publication guidelines, the author-date method will be used for in-text references, whereby the source reads as the last names of the authors, then the year (e.g., Smith 2004 or Smith and Jones 2004). A references section must be included that lists all references alphabetically by last name of the first author. References must be published works only. Exceptions to this rule are theses, dissertations, and “in press” articles, all of which are allowed in the references list.

## 7.5. Presentation and Interview

A presentation and interview on the approach and team effort on identifying the mobility issue and developing the smart mobility solution shall be delivered to an evaluation panel. This will be followed by questions from the panel. Teams are encouraged to use presentation technology as part of this presentation.

An oral presentation of up to seven (7) minutes shall be required for each participating school. All presentations shall be conducted in a professional manner (defined as a presentation which a professional engineer would give to a prospective client). Teams are encouraged to be entrepreneurial in conveyance of their proposed solution. Oral presentations shall be presented in English. Teams may use PowerPoint or other appropriate tools in the development of their presentation. Presentation order shall be randomly selected before the competition begins and shall be provided no later than the time of on-site registration. The oral presentations, including the question and answer period, shall be open to the public for viewing. An additional five (5) minute period shall be permitted for judges’ questions immediately following the oral presentation and may include questions by members of the audience if

time permits. The time required to set up equipment and take down shall not exceed four (4) minutes each.

As part of the presentation, teams may provide video, props, or physical displays to provide a better understanding or additional insight into of the proposed competition idea. Students should consider a smooth transition between any PowerPoint (or other presentation software) and other components of their presentation to maximize use of the allotted time.

### 7.6. Poster Presentation

Each team will create an innovative means to market their proposed solution. The marketing item shall clearly convey the intent, excitement, and innovation of the solution, as well as plans for its implementation. The target audience is your fellow students and the public! You want to get them to support your solution.

The marketing material shall be limited to the following dimensions:

- Flat with dimensions of 24" x 36"
- Single sided
- Written in English

Sponsors may be recognized on a separate poster. If English is not the dominant language where the competition is conducted an optional translation poster may be provided.

### 7.7. Scoring

- The score for the overall submission will be 25% of the total, based on the proposed solution's "Out of the Box" thinking.
- Written proposal of the smart mobility solution will be 30% of the total score.
- Presentation and Interview will be 30% of the total score.
- Poster presentation will be 15% of the total score.

Each category will receive a score based on evaluation by the judges.

## Section 8: Awards and Recognition

The winners of the Blue Sky Competition shall be determined by compiling a team's total number of points. ASCE shall award \$3,000 in cash prizes to the Society-wide Finals winning teams' ASCE Student Chapter. To be eligible to receive a prize, the entrant school must be a recognized ASCE Student Organization in good standing.

Total prizes shall be distributed as follows:

- 1<sup>st</sup> place overall winner: \$1,500 and trophy
- 2<sup>nd</sup> place overall winner: \$1,000 and trophy
- 3<sup>rd</sup> place overall winner: \$500 and trophy

A special award will be presented to the team that best demonstrates the spirit of the Blue Sky Competition with exceptional "Out-of-the-Box" thinking in their proposed solution.

## Section 9: Host School Requirements

There are three elements of this competition – evaluation of the written proposal, judging of the poster presentation, and the presentation of the proposed solution to an evaluation panel. Host schools are required to accommodate these elements.

### 9.1. Evaluation of Written Proposal

The student teams are required to submit a written proposal. The host school should set a deadline for these submissions far enough in advance of the conference to allow judges to adequately and fairly evaluate the proposals.

### 9.2. Presentation and Interview

The student teams are encouraged to develop an innovative means of presenting their product to an evaluation panel. Host schools should provide an auditorium or large classroom for this presentation. Schools should also provide a means for PowerPoint (or other presentation software), as well as other multimedia presentations.

### 9.3. Poster Presentation

The poster presentation should occur at the same time as other display competitions, such as concrete canoe. The host school should provide sufficient space for each competing school to display their poster presentation.