

Program Progress Performance Report for University Transportation Centers

Federal Agency and Organization Element to Which Report is Submitted:

U.S. Department of Transportation
Research and Innovative Technology Administration

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Project Title: National Center for Intermodal Transportation for Economic Competitiveness (NCITEC)

Program Director (PD) Name, Title and Contact Information (e-mail address and phone number):

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Recipient Organization (Name and Address): U.S. Department of Transportation

Research and Innovative Technology Administration
(Denise Dunn, UTC Grant Administrator)
1200 New Jersey Ave, S.E.
Washington, DC 20590

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Report Term or Frequency (annual, semi-annual, quarterly, other): Semi-annual, PPR5

Signature of Submitting Official: 

1. Accomplishments

As indicated in our grant application, NCITEC's major goals are to address the economic competitiveness and safety of the national intermodal transportation system. Economic competitiveness and safety are two of the five strategic goals that U.S. Department of Transportation (USDOT) has identified. The next section provides more specific goals of NCITEC.

1.1. What are the major goals and objectives of the program?

- Develop, implement and maintain a comprehensive research program that addresses the economic competitiveness and safety of the national intermodal transportation center.
- Develop educational programs in intermodal transportation that incorporate the multidisciplinary nature of intermodal transportation by drawing upon the resources of each university.
- Utilize modern educational technologies, and develop effective professionals in intermodal transportation.
- Enhance the public awareness, understanding, and appreciation of intermodalism and its role in the modern world, including career opportunities in the field.
- Offer interdisciplinary programs and experiential training in intermodal transportation operations to provide a steady source of transportation professionals to public and private organizations.
- Ensure the availability of research results to potential users in a form that can be directly implemented, utilized, or otherwise applied.
- Strengthen the collaboration between NCITEC consortium members as well as between federal, state, and local agencies.
- Develop ties with other University Transportation Centers (UTCs) and USDOT's research clusters to create opportunities for collaborative activities.

1.2. What was accomplished under these goals?

- *Develop, implement and maintain a comprehensive research program that addresses the economic competitiveness and safety of the national intermodal transportation center:* Most of the projects funded in 2012 have been completed. Their final reports will be available soon. The projects that were selected in the first half of 2013 have begun in the second half of 2013. Some of those projects will be completed towards the end of 2014.
- *Develop educational programs in intermodal transportation that incorporate the multidisciplinary nature of intermodal transportation by drawing upon the resources of each university:* The Mission Intermodal Excellence (MIE) project hosted its second group of middle school teachers in June. Seventeen teachers attended the program. They spent four days at Mississippi State University. During these four days trips were organized to the Tombigbee Waterways and to Fedex. Like in 2013, the students of these teachers will work on Public Service Announcements (PSAs) during the fall semester.
- *Utilize modern educational technologies, and develop effective professionals in intermodal transportation:* One of the ongoing NCITEC projects is about educating the next generation of

transportation professionals through well-designed education and Work Force Development (WFD) programs. Two student interns collected transportation course information across campus. They also assisted with the organization of the National Conference on Intermodal Transportation (NCIT) and development of the conference proceedings.

- *Enhance the public awareness, understanding, and appreciation of intermodalism and its role in the modern world, including career opportunities in the field:* The teachers who participated in the MIE program mentioned above will work with their 4th to 8th grade students and developed PSAs which will be available early in 2015.
- *Offer interdisciplinary programs and experiential training in intermodal transportation operations to provide a steady source of transportation professionals to public and private organizations:* We graduated several students who are now either looking for jobs or have recently found jobs. These students will be reported in the performance metrics that will be submitted at the end of 2014.
- *Ensure the availability of research results to potential users in a form that can be directly implemented, utilized, or otherwise applied:* The projects that began in 2012 are being completed and their results are already being published in archival journals and conference proceedings.
- *Strengthen the collaboration between NCITEC consortium members as well as between federal, state, and local agencies:* We are in close collaborations with state DOTs. The Mississippi (MDOT), Louisiana (LADOTD), Colorado (CDOT), and Virginia (VDOT) Departments of Transportation have all served as reviewers on some of our proposals. They are also providing matching funds.
- *Develop ties with other University Transportation Centers (UTCs) and USDOT's research clusters to create opportunities for collaborative activities:* The UTCs that were selected in 2012 and 2013 in Region 4 have been in communication to organize a regional conference. In April 2013, the UTCs in Region 4 held their first conference in Orlando, FL. The second conference was held in 2014 in Atlanta, GA. The third one is currently being developed and will be held in March 2015 in Birmingham, AL.

1.3. How have the results been disseminated? If so, in what way/s?

A few of the NCITEC projects are complete but most are still ongoing. Here is a list of some of the results reported by the PIs:

- Since the project's initiation, one M.S. defense and thesis has been completed. The PI will also present this work at the prestigious European Workshop on Structural Health Monitoring in July 2014. Three journal papers are in preparation; the two ASCE journal submissions will be submitted by August 2014.
- Via the peer-reviewed journal publication, a conference presentation and an outreach website (<http://biofuel.msstate.edu/>).
- The results have been presented in the 2013 Engineering Sustainability: Innovation and the Triple Bottom Line by the Mascaro Center for Sustainable Innovation at the University of Pittsburgh and the Steinbrenner Institute for Environmental Education and Research at Carnegie

Mellon University, the 2013 Canadian Society of Civil Engineers (CSCE) Annual Conference, the American Society of Civil Engineers (ASCE) Journal of Management in Engineering, and the ASCE's 2014 Construction Research Congress in Georgia Tech.

- The results have been disseminated through the 2013 NCITEC conference at Mississippi State University.
- Teachers will be writing a Blog to post on school webpages.
- Both Dr. Uddin and Dr. Altinakar were involved in outreach activities associated with the project objectives and expected results.
 - The NCCHE's initial extreme flood simulation results for the Sardis pilot site in northwestern Mississippi were used by Dr. Uddin to develop and post the following YouTube video on *infrastructureglobal* channel. http://youtu.be/h_FRfj-i8IA
 - Dr. Altinakar's PhD student Marcus McGrath was announced as 2013 Student of the Year (SOY) awardee.
 - Dr. Altinakar made several presentations to his flood research funding agencies, visiting delegations abroad.
- Dr. Uddin presented project overview and examples of on-going work to the following international visiting university delegations during their scheduled visits to CAIT Transportation Modeling & Visualization Lab in UM Jackson Center :
 - April 25-27, 2014: Dr. Rita Moura Fortes, Mackenzie University, Brazil
 - March 4-9, 2014: Dr. João Virgilio Merighi, Mackenzie University, Brazil
 - March 25-29, 2014: Vice Chancellor Dr. Parveen Shah and ProVC Dr. Lutfullah Mangi, Shah Abdul Latif University (SALU), Khairpur Mir's, Sindh, Pakistan
 - January 22-25, 2014: Vice Chancellor Dr. A.B. Soomro and ProVC Dr. Saleem Raza Samo, Quaid-E-Awam University Of Engineering, Science and Technology (QUEST), Nawab Shah, Sindh, Pakistan
- DSS-WISE Software used for the NCITEC project is now being employed by several federal agencies and Mississippi state agencies. The agencies that use DSS-WISE include: (a) DHS Dams Sector Branch; (b) USACE HQ; (c) USACE MMC; (d) USACE-ERDC; (e) USACE Vicksburg District; (f) Mississippi Department of Environmental Quality.
- Dr. Altinakar continued offering presentations and courses in the U.S. and abroad about the current use of DSS-WISE by federal and state agencies.
- Dr. Uddin prepared and posted the following video for YouTube channel of *infrastructureglobal* that includes project updates on supply chain, flood simulation, Gulf passenger rail restoration, and highway-waterway freight intermodal integration.

University of Mississippi – CAIT Overview; Research and Geospatial Workforce Development <http://youtu.be/8JjM2QEexFE>
- Dr. Uddin promoted his 2013 book "Public Infrastructure Asset Management" through blog pages and tweets. The book was published by McGraw-Hill in July 2013. The book includes several new sections on supply chain management, flood disaster impact examples, use of remote sensing imagery and geospatial technologies, asset management practice for transportation and other lifeline public infrastructure, and value engineering applications for investment decision making. The highlights of the book are discussed in the following blog post. <http://infrastructureglobal.com/dr-robert-khayat-ole-miss-chancellor-emeritus-infrastructure-improvement-cannot-be-delayed-if-we-are-to-continue-as-a-vital-nation/>
- Presentation of the results obtained up to date was done at the 2014 University Transportation Center (UTC) Conference for the Southeastern Region, March 24-25, 2014, in Atlanta, GA,

presentation title “Utilizing Acoustic Emission for Monitoring Safety of Highway Bridges,” by V. Khaikine, V. Jagasivamani, and E. Sheppard.

- The project results were disseminated at national and international conferences discussed in Section 2.1. The results have been disseminated through the website which provides all the material used during the workshop. The website also contains videos of some of the presentations delivered in the workshop, and other supporting materials.
- We gave an oral presentation at the ASEE-SE Annual meeting March 30th –April 1st 2014, at Mercer University in Macon, Georgia. Christina was the keynote speaker at the Mississippi Gulf Coast Gifted Teacher Association Conference, Pass Christian, MS. She also conducted this conference. In this conference teachers participated in two mission intermodal activities from Summer 2013 MIE Workshop.
- We also conducted classroom observations and conducted an engineering night for the Holly Springs, East Tallahatchie, Vicksburg, Kosciusko Middle School, and Columbus Middle School.
- We have presented our research to the City of Starkville's Transportation Committee.

1.4. What do you plan to do during the next reporting period to accomplish the goals and objectives?

We will participate in the Regional UTC Conference that will take place in March 2015 in Birmingham, AL. Here are some of the other activities that will take place:

- We will continue develop models, algorithms and we will further expand the web tool and the education module development.
- Detailed erosion analysis of the selected bridges will also continue into the second quarter, but at a lower priority. Combining the geological and engineering work will allow collaboration that should present a more complete understanding of the selected bridges and their potential erosional vulnerabilities. Networking with other professionals and organizations will continue.
- Complete version 1.0 of the web-based VMI software.
- Deploy version 1.0 of the web-based VMI software at test site in Rhode Island.
- Gather and analyze usage data and feedback from test implementation.
- Begin refining version 1.0 of the web-based VMI based on real-world implementation feedback.
- Begin documenting case study implementation.
- Submit conference abstract and begin writing conference paper.
- Professional Development with Teachers: Engineering, Transportation and Robotics
- Summer Camp for students for 5 days of activities
- Mentoring at each school to implement and develop activities for in classroom
- Teacher lesson plan development for continuation
- Dr. Uddin will also participate at the 2014 Mississippi Transportation Institute (MTI) Conference and Board of Directors meeting, which will be held on October 21, 2014 at the Jackson Convention Complex (JCC) in Jackson, Mississippi.
- During the next reporting period, we will construct a systematic sample of news stories from all incidents in our spreadsheet. We then will download all stories for the sample, conduct a pilot test of news stories to develop and refine a code sheet, conduct coder training, code the stories, and enter the story data and inter-coder reliability data. The analysis will examine interview sources, as well as reputation repair strategies and risk framing, in a systematic sample of at least 600 news stories about 40 selected accidents. As soon as we revise and finalize the social media code sheet and conduct coder training to promote inter-coder reliability, we plan to

analyze all social media posts from all companies listed in the spreadsheet. The social media analysis of transportation-related agencies will occur after the news analysis is completed, so that we can develop a comprehensive list of all agencies involved in the public crisis communications. Variables on the social media code sheet will include corporate reputation repair strategies, responsibility attributions, crisis responsibility levels, public risk perceptions, tweet/post characteristics, and crisis types. This analysis should provide contextual insights into the apparent corporate reticence to communicate directly with public audiences about transportation accidents.

- We will be working on (a) revising the lesson plans which teachers will be working on during the summer; (b) visit schools of participating teachers during Fall 2014; (c) collect and analyze data from surveys we have prepared and plan to distribute to students and teachers. These surveys collect data which will help us evaluate the efficiency of the program. We plan to summarize our findings and submit a conference/journal paper.
- Once the surveys have been approved, the interviews will take place with the appropriate contacts within the sectors of prosecutors, law enforcement and defense attorneys. After that information is collected, the new data will be analyzed and reviewed.

2. Products

2.1. Publications, conference papers, and presentations:

- Li, X. 2013. "An integrated modelling framework for design of logistics networks with expedited shipment services." *Transportation Research Part E*, 56, 46-63.
- Li, X. "Integrated Design of Logistics Networks with Expedited Shipments." 2nd International Transportation PhD Student Symposium, University of Illinois at Urbana-Champaign, September 2013.
- Boz, Mehmet*, *Islam El-adaway*, and Mohamed Eid*(2014), "A Systems Approach for Sustainability Assessment of Civil Infrastructure Projects", *2014 Construction Research Congress*, American Society of Civil Engineers, Georgia, United States, pp. 444-453.
- Boz, Mehmet* and *Islam El-adaway*, "Managing Sustainability Assessment of Civil Infrastructure Projects using Work, Nature, and Flow", *Journal of Management in Engineering*, American Society of Civil Engineers, doi: 10.1061/(ASCE)ME.1943-5479.0000203, 04014019, pp. 1-13.
- Boz, Mehmet and Islam El-adaway (2013), "Dynamic Sustainability Assessment of the Built Environment", 2013 Canadian Society for Civil Engineering Annual Meeting and Conference and 4th Construction Specialty Conference, Ontario, Canada, CON-01, pp. 1-10.
- Boz, Mehmet* and Islam El-adaway (2013), "Nature, Work, and Flow Sustainability Assessment of the Built Environment", 2013 Engineering Sustainability: Innovation and the Triple Bottom Line , Mascaro Center for Sustainable Innovation at the University of Pittsburgh and the Steinbrenner Institute for Environmental Education and Research at Carnegie Mellon University, Pennsylvania, United States.
- Poster presentation. "Passenger Intermodal Transportation in the United States: Urban-Rural Difference." Presented at the annual meeting of the National Center for Intermodal Transportation for Economic Competitiveness conference, October 31–November 1, 2013, Starkville, MS.

- Uddin, W. (2014). Environmental Sustainability Dimensions of Freight Transport Considering Highway and Waterway Intermodal Integration. *TRB-CMTS Conference: Innovative Technologies for a Resilient Marine Transportation System*, Washington DC, June 24-26, 2014. (Presentation on freight intermodal integration)
- Ding, Y., Kuiry, S.N., Elgohry M., Jia, Y., Altinakar, M.S., and Yeh, K.-C. (2013). Impact assessment of sea-level rise and hazardous storms on coasts and estuaries using integrated processes model, *Journal of Ocean Engineering*, Vol. 71, 1 October 2013, pp. 74–95. (Published) <http://dx.doi.org/10.1016/j.oceaneng.2013.01.015>
- Singh, J., Altinakar, M.S., and Ding, Y. (2014). Numerical Modeling of Rainfall-generated Overland Flow Using Nonlinear Shallow Water Equations. Under Review. Submitted to ASCE Journal of Hydrologic Engineering. (Journal paper under review)
- Ding, Y., Hossain, A.K.M., Zhang, Y., Jia, Y., and Altinakar, M.S. (2014). Simulation of Wind, Storm Surge, and Wave in Hurricane Sandy. *Proceedings of ASCE EWRI 2014 Conference "Water Without Borders"*, Portland, Oregon, June 1-5, 2014.
- Aleixo, R., Ozeren, Y., Altinakar, M.S., and Wren, D. (2014). Velocity Field Measurements in Tailings Dam Failure Experiments using a Combined PIV-PTV Approach. *Proceedings of the 3rd IAHR Europe Congress*, Porto, Portugal, April 14-16, 2014.
- Altinakar, M.S. (2014) NCCHE Research Highlights and Dam Break Flood Modeling Capabilities for NRCS. Presentation given to NRCS Mississippi at the USDA-ARS, National Sedimentation Laboratory, March 21, 2014. (Presentation)
- Altinakar, M.S. (2014) Dam-Break Flood Modeling Using DSS-WISE and Hurricane and Storm Surge Flood Modeling using CCHE2D. Presentation to FEMA Region 6 and URS Corporation, Dallas, Texas, February 5, 2014. (Presentation)
- Altinakar, M.S. (2014) Research and Development Highlights at NCCHE and Dam-Break Flood Modeling Capabilities. Presentation given to the Delegation of Chinese Academy of Sciences visiting NCCHE, Jan 21, 2014. (Presentation)
- Uddin, W. (2014). Environmental Sustainability Dimensions of Freight Transport Considering Highway and Waterway Intermodal Integration. *TRB-CMTS Conference: Innovative Technologies for a Resilient Marine Transportation System*, Washington DC, June 24-26, 2014. (Presentation on freight intermodal integration with contributions from research assistants Seth Cobb and David May)
- Sims, Haley. (2014). Impacts of Rapid Urbanization on Transport and Energy Demands along the Mississippi River Transportation Corridor. Paper for 2014 ITE Student Paper Competition, Institute of Transportation Engineers District 5, February 2014. (Outstanding 1st Place District Award)
- Headrick, Jessica and W. Uddin. (2014). Traffic Flow Microsimulation for Performance Evaluation of Roundabouts and Stop-controlled Intersections at Highway Overpass. *ATS - International Journal of Advances in Transportation Studies*, Issue, XXXIV, November 2014. (Accepted June 2014)
- Uddin, W. (2014). Environmental Sustainability Dimensions of Freight Transport Considering Highway and Waterway Intermodal Integration. *TRB-CMTS Conference: Innovative Technologies for a Resilient Marine Transportation System*, Washington DC, June 24-26, 2014. (Presentation on freight intermodal integration with contributions from research assistants Seth Cobb and David May)
- Headrick, Jessica and W. Uddin. (2014). Traffic Flow Microsimulation for Performance Evaluation of Roundabouts and Stop-controlled Intersections at Highway Overpass. *ATS - International*

Journal of Advances in Transportation Studies, Issue, XXXIV, November 2014. (Accepted June 2014)

- Sims, Haley. (2014). Impacts of Rapid Urbanization on Transport and Energy Demands along the Mississippi River Transportation Corridor. Paper for 2014 ITE Student Paper Competition, Institute of Transportation Engineers District 5, February 2014. (Outstanding 1st Place District Award)
- Uddin, W. A. Ahmed, and M.S. Ali. (2013). Satellite Imagery Applications of Urban Road Inventory, Traffic Flow Attributes, and Road Capacity Assessment. *IJRDET - International Journal of Recent Development in Engineering and Technology*, Vol. 1, Issue 3, December 2013, pp. 54-60. (published in January 2014)
- Uddin, W., W.R. Hudson, and Ralph Haas (2013). *Public Infrastructure Asset Management*. McGraw-Hill, ISBN 0071820116. (publication available since mid-July 2013)
- Presentation by V. Khaikine, V. Jagasivamani, and E. Sheppard, "Utilizing Acoustic Emission for Monitoring Safety of Highway Bridges," 2014 University Transportation Center (UTC) Conference for the Southeastern Region, March 24-25, 2014, Atlanta, GA.
- D'Souza, K. A. & S. K. Maheshwari (2014). *Comparison of Regional and Urban Transit Bus Driver Distraction*. Presented at the XX Urban Transport 2014 Conference, Algarve, Portugal, May 28-30, 2014.
- D'Souza, K. A. & S. K. Maheshwari (2014). *Comparison of Regional and Urban Transit Bus Driver Distraction*. Proceedings of the XX Urban Transport 2014 Conference, Algarve, Portugal, May 28-30, 2014. Editor: C.A. Brebbia. *Wessex Institute of Technology Press, Southampton, U. K.* Pages 89 - 100.
- D'Souza, K. A. & S. K. Maheshwari (2014). *A Methodological Approach for Studying Public Bus Transit Driver Distraction*. Under review by the International Journal of Sustainable Development and Planning. *Wessex Institute of Technology Press, Southampton, U. K.*
- Marufuzzaman M., Li X., **Eksioglu S.D.**, Wang J. "Analyzing the Impact of Intermodal Hub Disruption in Biofuel Supply Chain Network." TRB Annual Meeting, Jan. 12-16, 2014, Washington DC.
- **Marufuzzaman, M**, S.D. Ekşioğlu "Developing Reliable and Dynamic Intermodal Hub-and-Spoke Systems for Biomass." *ISERC Annual Meeting*, Montreal, Canada, May 31- June 2, 2014.
- Marufuzzaman, M, **S.D. Ekşioğlu** "Analyzing the Impact of Intermodal Hub Disruption on the Performance of Biomass Supply Chain Network." *ISERC Annual Meeting*, Montreal, Canada, May 31- June 2, 2014.
- Marufuzzaman M., Li X., Eksioglu S.D., Wang J. "Analyzing the Impact of Intermodal Hub Disruption in Biofuel Supply Chain Network." TRB Annual Meeting, Jan. 12-16, 2014, Washington DC.
- Marufuzzaman, M, S.D. Ekşioğlu "Developing Reliable and Dynamic Intermodal Hub-and-Spoke Systems for Biomass." Proceedings of the ISERC, Montreal, Canada, May 31- June 2, 2014.
- **Lucy N. Ly**, Sandra Eksioglu, Burak Eksioglu, Christina McDaniel, Eric Heiselt "Mission Intermodal Excellence," Poster presentation at the Undergraduate Research Symposium, Mississippi State University, April 4, 2014. *Won the 2nd place in the Community Engagement poster competition*
- **Sandra Eksioglu**, Burak Eksioglu, Christina McDaniel, Eric Heiselt "Mission Intermodal Excellence," ASEE-SE Annual Meeting, March 30th –April 1st 2014, at Mercer University in Macon, Georgia.
- **Christina McDaniel**, Sandra Eksioglu, Burak Eksioglu, Eric Heiselt Mississippi Gulf Coast Gifted Teacher Association Conference, Pass Christian, MS.

- Li, X., Medal, H., and Wang, J. “A Network Design Model under Connectivity Constraints with Heterogeneous Services.” In: Proceeding of the 93rd TRB Annual Meeting, Washington D.C., January 2014
- Li, X., Medal, H. and Wang, J. “Infrastructure Network Design under Additive Service Utilities.” Presented at the INFORMS Annual Meeting, Minneapolis, October 2013

2.2. Website(s) or other Internet site(s):

All products will be published on NCITEC’s web site (www.ncitec.msstate.edu).

MIE project websites:

- Overview: <http://www.bagley.msstate.edu/outreach/mission-eggcellence/2013-mission-intermodal-excellence/>
- Video: <http://www.bagley.msstate.edu/outreach/mission-eggcellence/2013-mission-intermodal-excellence/mission-intermodal-overview/>
- Resources: <http://www.bagley.msstate.edu/outreach/mission-eggcellence/2013-mission-intermodal-excellence/mission-intermodal-resources/>

Other project websites:

- <http://biofuel.msstate.edu/>.
- UM CAIT web page: <http://www.olemiss.edu/projects/cait/ncitec/>
The NCITEC project tab on CAIT web site, linked to the University of Mississippi web site, provides useful background of NCITEC goals and university partners.
- Blog: <http://infrastructureglobal.com/>
InfrastructureGlobal is a blog about infrastructure and natural disasters around the globe. Dr. Uddin created this blog site after the devastating floods of Mississippi River basin in May 2011. Of particular interest is a recent post on 2013 infrastructure book and a previous post (July 30, 2012) based on M.S. thesis of CAIT graduate student (Alper Durmus), where satellite imageries were used with the field inspection data to create flood damage map of a higher education institution campus near Bangkok, Thailand. The campus was inundated for 6 weeks during October-November 2011. <http://infrastructureglobal.com/bangkok-2011-flood-damage-assessment-using-1-m-satellite-imagery-ait-campus-infrastructure-assets/>
- <http://infrastructureglobal.com/public-infrastructure-asset-management-w-uddin-w-ronald-hudson-ralph-haas-mcgraw-hill-new-york-2013/>
- YouTube Videos: over 800 views of seven project related YouTube videos were reported by the first week of January 2014.
- SlideShare: A recent slide presentation was posted on “NCITEC Intermodal Transportation and Disaster Safeguard Research Projects at CAIT.” <https://www.slideshare.net/waheeduddin/uddin-caitncitecprojects11-oct2013slsh> Over 2,017 SlideShare views of 7 presentations.
- <http://biz.hamptonu.edu/esitac/> - the Eastern Seaboard Intermodal Transportation Applications Center (ESITAC) website.
- <http://walkandrideoptimization.msstate.edu/>

2.3. Technologies or techniques:

- The SSI modeling procedure applied to the bridges in this project is an extension of the technique developed by the co-PI, Dr. Chris Mullen, described in the recently published chapter

entitled, “FE Based Vulnerability Assessment of Highway Bridges Exposed to Moderate Seismic Hazard,” of a book entitled, “Engineering Seismology, Geotechnical and Structural Earthquake Engineering,” D’Amico S, ed., ISBN 978-953-51-1038-5, published online by In-Tech.

- Robotics kits for each school
- Teacher Journals and learning modules
- Geospatial mapping of Mississippi River barge freight and highway and rail networks in NAFTA countries:
 - Freight intermodal integration of highway truck traffic and barge traffic on Mississippi River and CO₂
 - Commodity flow by barges for states along Mississippi River
 - US/NAFTA highway buffers for integration with rail
 - Major highway network in NAFTA countries
 - Freight rail network in NAFTA countries
 - CO₂ Footprints at international bridges of NAFTA corridors on U.S.-Mexico border
- We have developed two novel methods that will be shared with other scholars via at least one refereed conference paper. First, we measured and correlated brand strength of shipper and carrier companies with their social media presence and other crisis communications activities.
- The journal paper presents the technique we used in order to solve the reliable and dynamic hub-and-spoke supply chain model. The technique developed is an enhancement of the Benders decomposition algorithm. We have integrated a rolling horizon technique in the Bender’s decomposition algorithm.
- A method to automatically generate graph representations of multi-modal networks based on GIS data
- A travel cost function for multi-modal networks involving both automobiles and pedestrians

2.4. Inventions, patent applications, and/or licenses:

Nothing to report.

2.5. Other products, such as data or databases, physical collections, audio or video products, software or NetWare, models, educational aids or curricula, instruments, or equipment

- We developed class materials which are distributed (as handouts and also soft copies) to teachers during the MIE workshop. The teachers should be able to use these materials to introduce students to intermodal transportation.
- Students’ course reports and project draft tech memos on: (1) “Energy and Transportation related CO₂ for States Mississippi River Buffer”, (2) “Mississippi River Commodity Flow”, (3) “Infrastructure funding”, (4) “Pavement Friction Measurement and Interpretation”, (5) “Geospatial Database of Highway and Rail Networks in NAFTA Countries (Canada, U.S., Mexico)”.
- We developed class materials which are distributed (as handouts and also soft copies) to teachers during the workshop. The teachers should be able to use these materials to introduce students to intermodal transportation.

3. Participants & Other Collaborating Organizations

3.1. What other organizations have been involved as partners?

Organization Name: **Louisiana Transportation Research Center (LTRC)**

Location of Organization: **Baton Rouge, Louisiana**

Partner's contribution to the project (identify one or more)

Financial support; **\$34,996.**

Organization Name: **Louisiana State University**

Location of Organization: **Baton Rouge, Louisiana**

Partner's contribution to the project (identify one or more)

Financial support; **\$52,584**

Organization Name: Norfolk Southern

Location of Organization: Atlanta

Partner's contribution to the project: Data

Organization Name: Mississippi State University CAVS Extension

Location of Organization: Canton, MS

Partner's contribution to the project: Financial support, Facilities (office space, conference rooms), Collaborative research, and Personnel exchanges.

Organization Name: Miller Intermodal Logistics

Location of Organization: Ridgeland, MS

Partner's contribution to the project: In-kind support, Collaborative research, and Personnel exchanges

Organization Name: Brookhaven High School

Location of Organization: Brookhaven, MS

Partner's contribution to the project: Facilities, Collaborative research and Personnel exchanges

Organization Name: East Flora

Location of Organization: East Flora, MS

Partner's contribution to the project: Facilities, Collaborative research and Personnel exchanges

Organization Name: Northeast Madison

Location of Organization: Camden, MS

Partner's contribution to the project: Facilities, Collaborative research and Personnel exchanges

Organization Name: Goodloe

Location of Organization: Canton, MS

Partner's contribution to the project: Facilities, Collaborative research and Personnel exchanges

Organization Name: Huey Porter

Location of Organization: Canton, MS

Partner's contribution to the project: Facilities, Collaborative research and Personnel exchanges

IAVO Research & Scientific, Durham, North Carolina: IAVO has provided licenses of the GeoSPHERIC package that embeds a new version of the GeoGenesis® geospatial software. The software has been installed on seven computer stations in CAIT Transportation Modeling and Geospatial Labs. The value of the software for each computer seat is being used as in-kind cost share for this project. Their help is also acknowledged for identifying imagery specifications and providing training data to CAIT students.

Organization Name: VDOT

Location of Organization: Hampton Roads District

Partner's contribution to the project:

In-kind support, Facilities – VDOT works with HU to select suitable bridge structures for testing and grants and provides access to them

Collaborative research – VDOT works with HU to provide general oversight of the research and will help to disseminate research findings

Organization Name: Mistras Group, Inc.

Location of Organization: Princeton Junction, NJ

Partner's contribution to the project: In-kind support, Facilities – Mistras Group, Inc. provides consulting and training

3.2. Have other collaborators or contacts been involved?

- Organization Name: Quality Transportation Services
Location of Organization: Mechanicsville, VA
Partner's contribution to the project (identify one or more): Collaborative research and Personnel exchanges.
- John Knight – Kansas City Southern Railroad will provide a tour of the transportation hub for rail to truck operations in Richland, MS. Students will receive a presentation (7/23/14).
- Brittany Tait – Nissan will provide a plant tour on car manufacturing process and delivery (7/23/14).
- Bobby Ware – First Student transportation will provide transportation to tours
- Mississippi Department of Transportation (MDOT): MDOT Roadway Design Division has been contacted for access to aerial imagery for candidate sites(s) in Mississippi. Follow up of initial contacts was made through an EIT who is Dr. Uddin's former student and CAIT staff.
- MDOT Planning Division through contact with Dr. Uddin's former student and EIT for accessing overlapping aerial imagery scenes of the study sites.
- MDOT Transportation Information Director (Mike Cresap) has been especially helpful to provide data and photos for the I-55 bridge on the Sardis site and updated geospatial database of all state maintained highways and bridges of Mississippi. This has been a very important contribution to this project.
- Mississippi Automated Resource Information System: MARIS is a statewide resource agency in Mississippi for no-cost Landsat imagery and DEM data sources of selected counties in Mississippi. <http://www.maris.state.ms.us/> Project researchers have downloaded bare ground 5-ft DEM/contour data and 2-ft aerial imagery scenes of Sardis site. Additionally, Dr. Uddin contacted MARIS and requested 2-ft aerial imagery and DEM of other candidate sites. We received this data for Tunica site on a USB hard disk.
- US Army ERDC Hydraulics Lab, Vicksburg, Mississippi (Dr. Kenneth Ned Mitchell)

- To develop a strategy for evaluating the social media and news media “blackouts” in covering serious transportation accidents, we consulted with Dick Starmann, a crisis communication consultant who also served as vice president for communications for McDonald’s Corporation for 30 years. In addition, communications representatives from several key transportation companies and agencies, as identified through data analyses, may be asked to provide additional insights into the data interpretations.

4. Impact

4.1. What is the impact on the development of the principal discipline(s) of the program?

- Both the structural health monitoring and non-destructive evaluation communities will be affected by this work. Structural health is addressed by researchers in such fields as computer science, civil engineering, mechanical engineering, reliability engineering, statistics, and electrical engineering. The determination of any damage threshold is an actively pursued research topic and is extremely complex for civil infrastructure. Thus, this project will increase the base of knowledge for low frequency structures.
- The further development of laser techniques and their adaptation to infrastructure has the potential to transform inspection and maintenance. The developed method will apply to broad classifications of structures and will significantly improve current infrastructure management. This methodology will apply to both railroad and highway bridges (both passenger and freight) as well as potentially extending to dams, levees, buildings, etc. The eventual goal is to provide condition-based maintenance via a cost-effective product that will transverse any structure and identify an overall change in its stiffness, indicating that localized inspection is required before a bridge collapse, for instance.
- We propose an integrated methodological framework that takes advantage of optional expedited transportation services and addresses decision components in both planning and operational stages simultaneously. This framework bridges the gap between planning models of network logistics systems and operational models of multimodal transportation configuration and inventory management decisions in the logistics system design literature. It enables logistics planners to ponder all these involved critical decisions in an integrated manner and design a system that performs more reliably and runs at a lower cost compared to traditional results. Our proposed model framework can efficiently and accurately solve an integrated logistics system design problem, and the optimal design solution can balance all cost components (including initial investment, regular and expedited transportation cost, and inventory management cost) and thus yields a minimum expected net cost. In addition, we showed interesting managerial insights into the optimal system design, such as relative importance and savings from integrating the expedited shipment option under different problem settings.
- The proposed intermodal simulation model is expected to have a significant impact on freight network planning and improvement, especially on project selection and prioritization and on demonstration the benefits of investment. The simulation model will help to compare intermodal designs and improvement projects and select ones with best benefit-cost ratios.
- This research is expected to: (1) develop an innovative systems-based analytic framework to assess sustainability for new, reconstructed, or rehabilitated transportation infrastructure; and

(2) provide comprehensive life-cycle analysis using case studies to determine spatial interdependencies, interactions, and measurements of the different sustainability indicators to verify which factors and characteristics are interrelated. This will significantly improve intermodal transportation system planning, design, performance, and evaluation.

- The findings of the research will be used to expand the field of sociology of transportation. Sociology of transportation has addressed lots of transportation topics within the framework of sociology. However, intermodal transportation has never been studied in this field, to the best knowledge of the PI.
- The findings of the research will be used to fill this gap in transportation geography and sociology of transportation by studying the economic and demographic impacts of passenger rail systems. The economic and demographic impacts of highways, airways, and public transportation have been studied in several disciplines, resulting in an assortment of theoretical and empirical studies. However, little work has been undertaken to study the economic and demographic impacts of passenger rail systems, especially in the U.S. To the best knowledge of the PI, no existing studies have examined intermodal passenger transportation accessibility as provided by passenger rails, highways, and airways as well as their collective impacts on the economy and population change.
- The UM's CAIT Transportation Modeling & Visualization Lab was furnished in Spring 2013 with eight new high performance computer equipment, new computer furniture, large video monitor for presentations, and seminar/meeting tables, chairs, and accessories. Additional six older computers were moved from 213 Carrier Hall Computer Lab in Summer 2013. Geospatial course was taught in this facility to 4 UG and 3 new graduate students in Fall 2013 and again in 2014 Intersession to 6 UG students. Most of the NCITEC project research work is conducted in this lab.
- Dr. Uddin's NCITEC projects at CAIT supported 5 PhD students, 3 M.S. students, 11 UG Civil Engineering students, and 3 UG non-engineering students.
- Graduate and UG student workers are being trained for 2D GIS and advanced geospatial planimetrics analysis and visualization applications in infrastructure, transportation, flood risk modeling, and environmental areas.
- Geospatial course contents have been enhanced using examples from the NCITEC project products.
- The contents of geospatial courses CE495 and ENGR597 Section 25, taught by Dr. Uddin, were updated and these courses will be offered again in future intersemester and/or regular sessions.
- New graduate and undergraduate CAIT student workers are also being trained for geospatial planimetric extraction of built infrastructure, flood plain mapping, and transportation demand modeling.
- The impact on the development of the principal discipline includes advancement of the NDT technology and expertise by integrating the AE technology, data acquisition, and remote sensing for analysis and prediction of factors that lead to deterioration and wear in the highway structural components under the stresses of traffic environment. This research also provides student education and training and builds the foundation for transportation related courses within the department which serves to attract and educate more students and, in turn, impacts the development of the principal discipline.
- The intermodal capacity models and the relationship functions between transportation volume and travel time (or speed) at the macro level will have a significant impact on intermodal transportation management and planning. At the operational level, the congested traffic can be efficiently guided to alternative routes and other transportation modes that have extra capacity.

The congestion could be recurrent or non-recurrent, such as disruptions caused by terrorist attacks or national disasters. At the strategic level, the predicted traffic demand can be assigned to intermodal network to identify the best investment to improve transportation efficiency. The project directly responds to the National Center for Intermodal Transportation for Economic Competitiveness's objective of *"to improve intermodal connectivity, enhanced operational integration, capacity enhancement, safety, and reduction of congestion in the nation's transportation system."* The proposed efforts are closely related to the research topics listed in the NCITEC, such as *modeling of intermodal transportation, development and evaluation of innovative technologies designed to enhance intermodal economic competitiveness, and improvement intermodal system resilience.*

- The stakeholders of this project include intermodal transportation organizations, emergency/risk management officials, media organizations, government agencies, and public audiences. After the data analysis phase, the project will provide practical implications for future risk message design, not only for the corporate and governmental communications representatives who must talk to the media in the aftermath of transportation accidents but also for journalists who cover these events. It also could identify the news routines and reporting strategies used in coverage of serious transportation incidents, as well as a framework for improved news coverage of these incidents. Ultimately, a better understanding of corporate crisis communication and reputation management could minimize the economic and environmental impact of future toxic spills in intermodal transportation.
- Scholarly contributions will include an exploratory analysis of media blackout in regards to transportation incidents over the last decade, as well as the testing and dissemination of an original theoretical model of outrage mitigation relevant for crafting public communications about transportation-related accidents. The model posits that explanatory content such as risk comparisons, relative risk assessments, explanation of testing/cleanup processes, translation of relevant transportation or risk communication research, and practical advice to audiences may reduce public outrage to transportation accidents. The explanatory content is believed to mitigate these responses, even when content that promotes high uncertainty is also disseminated. Outrage-provoking content includes speculation, off-record news sourcing, conflicting reports, vague advice for avoiding exposure to hazards, or false alarms. We hope the project will expand the model by examining direct (social media) risk framing vs. news risk framing.

4.2. What is the impact on other disciplines?

- This project uses civil infrastructure to link civil engineering to signal processing, sensor development, and computational algorithms.
- Most existing studies focus on freight intermodal transportation but ignore the passenger aspect. This study will fill this gap in the literature by examining the combinations of modes of transportation. This will contribute to the related research in transportation planning. This research will also provide suggestions for passenger intermodal transportation planning.
- This research also contributes to the field of transportation planning. It is important to study the impact of passenger rails because there is an increasing debate over whether passenger rails, rail transit, and high-speed trains should be expanded or built in the U.S. It is also important to study them within the context of passenger intermodal transportation because intermodal systems have become increasingly important for transportation performance and efficiency, and

planning practices are focusing more attention on intermodal systems as a whole rather than any single mode of transportation.

- It is expected that research accomplishments from this project will be introduced in the computational hydroscience graduate program courses offered by Dr. Altinakar.
- Journalism department's students often contact Dr. Uddin for their Planet Forward video projects every year on sustainability related topics for posting on George Washington University's Planet Forward web site every year. Dr. Uddin discusses with potential Journalism students the findings and significance of this project so that impacts of extreme flood events on infrastructure can become one of their projects. The following example of Planet Forward video on the use of waste glass for sustainable road applications was produced by UM journalism student in May 2013. Earlier another student's YouTube video on life cycle analysis for sustainability projects was posted on Planet Forward web site.
- The risk of toxic transportation spills increases the challenges and potential costs of operating the intermodal network of highways, rails, waterways, airports, and shipping terminals. Examining how these accidents are presented to the public could help corporate leaders and governmental policymakers more effectively determine the levels of transportation-related risk that are acceptable and affordable. Examining public risk messages about these incidents also may mitigate potential public outrage after accidents and help transportation leaders identify priorities for response and preparedness.

4.3. What is the impact on the development of transportation workforce development?

- The potential outcomes are more pointed inspections and condition-based maintenance rather than time-based maintenance. The ideal results would be a method of speedy non-contact inspections that can evaluate internal structural damage. Once the new technique is finalized, D.O.T. inspectors will need training in quantitative structural deterioration measurements.
- Educational impacts have transpired during this project. This project has already reached three graduate students and is currently funding one of them. Public education is not warranted at this time.
- The project will help the involved universities, Louisiana State University and the University of Tennessee, to build research capability and expose new models to other transportation researchers in the two universities, such as the Center for Transportation Research at the University of Tennessee and the Center for Transportation Analysis at the Oak Ridge National Lab.
- The PI has developed and offered a split-level course titled "Transportation and Society" in the Springs of 2012 and 2013. The syllabus of this course can be found at <http://guangqingchi.sociology.msstate.edu/teaching.html>. Passenger travels and intermodal transportation systems are two of the main components. Students are enthusiastic about the two topics, as they are relevant to their daily lives. Four students used the 2009 NHTS data for their term papers; they are encouraged to participate in the poster presentation of the NCITEC conference held in Fall 2013. The PI will teach this course again in Spring 2015. The PI plans to involve students in the proposed research project by communicating the project progress with the students, taking input from students, and encouraging students to study passenger travels using the 2009 NHTS data.
- In addition, Mr. Bishal Kasu, a graduate student in sociology, has been assisting with literature review and data cleanup and analysis under the supervision of the PI.

- The PI has initiated, developed, and twice taught a split-level course titled “Transportation and Society” (syllabus available at <http://guangqingchi.sociology.msstate.edu/teaching.html>). This class addresses the economic and demographic impacts of transportation (including passenger rails) from the perspectives of sociology, geography, demography, economics, regional science, and policy and planning. Students are enthusiastic about this topic. They develop term papers related to this topic and are encouraged to submit to journals and participate in transportation-related conferences. The PI will teach this course once a year in the future and plans to involve students in the proposed research project by communicating project progress with them, considering their input, and encouraging them to study passenger rails. A module addressing passenger rails, environmental sustainability, and community livability will also be developed.
- In addition, the PI taught the “Spatial Analysis of Social Data” course in the Spring of 2014. Transportation is one element of this course as transportation plays an important role in spatial dynamics of social phenomena. The knowledge obtained from literature review of this research is used for this course. One student developed a term paper focusing on the demographic impact of passenger rails.
- The ongoing research project in the field of transportation at the HU Department of Engineering offers stipend and tuition scholarships to undergraduate students. Four undergraduate students participated in this research so far. It offers students an opportunity to gain specific knowledge and hands-on experience with AE technology both in the laboratory setting and in the field therefore making an impact on the development of transportation workforce.
- Provided opportunities for research and teaching in transportation and related disciplines;
- Improved the performance, skills, or attitudes of members of underrepresented groups that will improve their access to or retention in transportation research, teaching, or other related professions;
- Developed and disseminated new educational materials or provided scholarships; or provided exposure to transportation, science and technology for practitioners, teachers, young people, or other members of the public?)
- In light of the scant crisis communications we have discovered, the project could impact workforce development through improved public communications about transportation-related toxic spills. Improved communications ultimately would provide more public exposure to information about transportation risks, preparedness, and crisis response. This information and awareness, in turn, could promote informal and formal education about transportation problems and solutions across many disciplines.

4.4. What is the impact on physical, institutional, and information resources at the university or other partner institutions?

- Existing equipment was exploited herein, except for the frame assembly. Also, Co-PI Chambers has provided new laboratory space in the National Center for Physical Acoustics building that expands the Department of Civil Engineering’s research capabilities. Access to existing machine shop facilities greatly expands the PI’s vibration research abilities. This would not have been possible without the collaboration on this effort and the prior project.
- The project will provide the involved universities, Louisiana State University and the University of Tennessee, simulation models for future research.
- The project impacts on enhancing current capabilities and research infrastructure at both CAIT and NCCHE units of the University of Mississippi include:

- *Physical infrastructure resources:* Computing facilities, geospatial laboratory, geospatial and flood simulation software. CAIT Transportation Modeling & Visualization Laboratory in UM Jackson Center has acquired 8 new computers and 6 old computers from CE Graphics Lab. These computer stations have been functioning fully since Fall 2013 after installation of geospatial software and other programs. Most project staff and graduate students are using this lab in 2014.
- *Institutional resources:* Involving Student Chapter of Institute of transportation Engineers (ITE) in project activities and developing a workshop model. A major goal to support undergraduate students is to motivate them to pursue graduate studies in geospatial and disaster impact topics.
- *Information resources and electronic means:* CAIT web pages, news interviews by journalism students, You Tube video and SlideShare production, blog posts, tweets, and scientific papers.
- (Over 2,017 SlideShare views of 7 presentations on transportation and infrastructure and over 1,180 views of project related 7 YouTube videos to date.)

4.5. What is the impact on technology transfer?

- State D.O.T.s and regional construction firms have been contacted by the PI for input, including both technical as well as advice on to how best to transfer any new technique to field inspectors. The only obtained feedback thus far has been through the Ole Miss Alumni Association. Also note that user friendly software is in development, and a proposal has been submitted to the FHWA.
- The major targeted audience of this research is State DOTs, who are expected to use the developed simulation to evaluate their freight network and select network improvement projects. The simulation model will also be a good tool to demonstrate the benefits of investment on freight management. The results could also benefit USDOT for transportation planning and promotion of intermodal solutions.
- An intermodal freight simulation model framework incorporates macro-level relationship between volume and speed relationships at intermodal network links and nodes, which may be across different modes and uses a comprehensive performance measurement system. The framework can be applied to study other state-level freight networks. A simulation model for the Louisiana freight network that can be used to evaluate the effectiveness of the network for freight management. The intermodal freight simulation model is expected to help LaDOTD comprehensively evaluate the State's freight movement performance, identify bottlenecks, and provide suggestions to LaDOTD on how to improve the State's intermodal network in a systematic way and evaluate the effectiveness of various investments on intermodal capacity expansion.
- The project is making positive impacts on commercial technology or public use, including:
 - Transfer of flood risk maps and decision support system framework for disaster vulnerability reduction to local and state government agencies for enhancing flood related emergency management.
 - Collaboration with geospatial industry and other stakeholders for enhancing modeling of built infrastructure and offer added value of flood disaster visualization.
 - Presentation of research results at conferences and workshop and participation in other conferences will be used for government and industry outreach, implementation in

practice, and future training courses for interested agencies and consulting service providers.

- Preparation of refereed papers, making conference presentations, and participating in regional and international conferences, NCITEC workshop, and annual Transportation Research Board (TRB) meeting.
- Using these research dissemination and outreach efforts for establishing contacts with government and industry stakeholders, academia, implementing in practice, and offering future presentations to interested agencies and emergency management authorities.

4.6. What is the impact on society beyond science and technology?

- Causing loss of use and even loss of life, bridge failures are high profile bad news, such as the I-35 Minneapolis collapse. Better safety management will instill more public confidence in state DOTs. The economic benefits of condition-based maintenance are well established, including reduced visual inspection and potentially longer structural life. More accurate estimation of remaining life could potentially prevent collapse but, at a minimum, will aid decision-making on the bridge's upkeep.
- The broader impacts include 1) involvement of various stakeholders of the potential New Orleans-Orlando Corridor (NOOC), 2) outreach of restoring the NOOC in relation to community livability and environmental sustainability, and 3) recommendation of strategies for optimizing intermodal transportation systems to better facilitate passenger travel and proposed resilience enhancement strategies, especially for evacuation purposes and providing relief services after disasters.
- The project is likely to make an impact beyond the bounds of science, engineering, and the academic world on areas such as:
 - Enhancing public understanding of flood disaster, prevention, and mitigation through visualization products which are easy to understand and communicate with government stakeholders, businesses, media, and general public.
 - Adapting the developed approach for flood disaster mitigation practices, decision support systems for disaster evacuation routing and emergency management, and landuse and flood control policies.
 - Implementing disaster protection methodologies and web-based social networking tools to build disaster resilience infrastructure and communities, improve community preparedness and infrastructure defense against flood disasters, and protect social fabric, economic viability, civic facilities, and environmental conditions against flood disasters.
- This study affects the passenger and freight transportation network by trying to predict and analyze potentially critical highway structure deficiencies therefore lowering the repair and maintenance costs and minimizing traffic flow disruptions that occur when elements of transportation network need to be closed down for major repairs. Therefore, beyond science and technology, this study directly influences the Economic Competitiveness goal of the U.S. D.O.T.
- The project will identify implications for changing practices in crisis communications about future transportation accidents, to improve crisis communications practice, increase public understanding, and minimize the economic and environmental impact of future accidents. The recommendations developed from these implications will be disseminated to public information

officers from corporate and agency representatives through a presentation at the annual National Public Health Information Coalition convention in Atlanta, which includes many agency PIOs involved in crisis communications and/or a transportation-related convention such as a University Transportation Center conference.

- Recommendations for improved news coverage of transportation incidents will be shared with journalists and news organizations through a presentation at a professional journalism conference such as Association for Education in Journalism and Mass Communication (AEJMC) or Society for Environmental Journalists – or by publishing an article in a trade magazine such as *Columbia Journalism Review* or *American Journalism Review*.

5. Changes/Problems

5.1. Changes in approach and reasons for change:

Nothing to report.

5.2. Actual or anticipated problems or delays and actions or plans to resolve them:

Nothing to report.

5.3. Changes that have a significant impact on expenditures:

Nothing to report.

5.4. Significant changes in use or care of animals, human subjects, and/or biohazards:

Nothing to report.

6. Special Reporting Requirements

No additional award-specific reporting requirements.