METROFREIGHT CENTER OF EXCELLENCE
MID-TERM REVIEW

Genevieve Giuliano

_____ _____September 15, 2015_____

Genevieve Giuliano, Director Date

MF

METROFREIGHT

Volvo Center of Excellence

1. BASIC INFORMATION ON THE COE

1.1 GRANT HOLDER AND AFFILIATION

CoE name: METROFREIGHT: the Local/Global Challenge of Urban Freight
CoE project number: CoE-2012-01
Grant holder's name: METRANS Transportation Center
Grant holder's affiliation: Sol Price School of Public Policy, University of Southern California
650 Childs Way, RGL 216, Los Angeles, CA 90089-0626
Grant holder's contact: giuliano@price.usc.edu, 213.740.3956
Percent funding from CoE: 45%

1.2 TIME TABLE

Date of receipt of CoE grant: April 9, 2013
Effective date of start of CoE: May 24,, 2013
Annual Report Year 1: December 3, 2013
Annual Report Year 2: September 29, 2014
Est. close of VREF funding: December, 2017

1.3 CORE PARTNERS

Name of Partner	Contact Person	% of CoE Grant Fund
METRANS Transportation Center, Sol Price School of Public Policy, University of Southern California (USC)	Genevieve Giuliano, Director and Prof.	45%
Center for International Trade and Transportation, California State University Long Beach (CSULB)	Thomas O'Brien, Executive Director	13%
IFSTTAR, French Institute of Sciences and Technology in Transport, Development and Networks, Paris, France	Laetitia Dablanc, Director of Research	16%
USDOT Region 2 Univ. Transp. Center (UTRC), Dept. of Global Studies and Geography, Hofstra University, New York, NY	Jean-Paul Rodrigue, Professor	16 %
Department of Logistics Research, The Korea Transport Institute (KOTI), Seoul, Korea	Sangbeom Seo, Research Fellow	10%

1.4 PARTICIPATING RESEARCHERS/TEACHERS/STUDENTS

Name	Affiliation	Role(s) in the CoE	% of Full-Time for CoE
Genevieve Giuliano	USC	Director, LA team leader, researcher	10
Catherine Showalter	USC	Project Manager (Feb 2014 – present)	37
Ryan Cassutt	USC	Grad Research Asst (fall 2013)	25
Sanggyun Kang	USC	Grad Research Asst (fall 2013 – present)	50
Quan (Jack)Yuan	USC	Grad Research Asst (fall 2014 – present)	25
Nathan Hutson	USC	Grad Research Asst (Jan 2015 – present)	25
Maged Dessouky	USC	Researcher	3
Lunce Fu	USC	Graduate Research Asst	25
Petros Ioannou	USC	Researcher	3
Saeid Jafari	USC	Graduate Research Asst	25
Yihang Zhang	USC	Graduate Research Asst	25
Yanbo Zhao	USC	Grad Research Asst (summer 2015)	57
Filipe Vital	USC	Grad Research Asst (summer 2015)	57

Name	Affiliation	Role(s) in the CoE	% of Full-Time for CoE
George Lymperopoulos	USC	Grad Research Asst (summer 2015)	57
Geraldine Knatz	USC	Researcher	6
Thomas O'Brien	CSULB	Director, Education and Outreach	15
Tyler Reeb	CSULB	Project Mgr, (April 2014 – present)	3
Ali Taleqani	CSULB	Grad Research Asst, (Jan – June 2014)	5
Samira Taleghani	CSULB	Grad Research Asst, (Jan – June 2014)	5
Annette Kunitsa	CSULB	Grad Research Asst, (Jan – June 2015)	5
Jubin Sukhadia	CSULB	Grad Research Asst, (Jan – June 2015)	5
Laetitia Dablanc	IFSTTAR	Paris team leader, researcher	30
Francoise Bahoken	IFSTTAR	Cartographer	5
Adrien Beziat	IFSTTAR	Graduate Research Asst	100
Adeline Heitz	IFSTTAR	Graduate Research Asst	100
Emilie Gaubert	IFSTTAR	Statistician (first 2 years)	20
Eleonora Morganti	IFSTTAR	Researcher (first 2 years)	20
Martin Koning	IFSTTAR	Researcher	10
Antoine Montenon	IFSTTAR	Research Engineer	20
Petronille Reme-Harnay	IFSTTAR	Researcher	10
Nora Marei	IFSTTAR	Post-doctoral researcher (last 6 months)	10
Pierre Launay	IFSTTAR	Doctoral student (last 6 months)	5
Pierre Camilleri	IFSTTAR	Doctoral student (last 6 months)	5
Gwenaelle Raton	IFSTTAR	Researcher (last 6 months)	10
Jean-Paul Rodrigue	UTRC	New York team leader, researcher	5
Alison Conway	UTRC	Researcher	15
Penny Eickemeyer	UTRC	Coordinator/Researcher	10
Camille Kamga	UTRC	Researcher	5
David King	UTRC	Researcher	5
Benjamin Miller	UTRC	Researcher	50
Robert Paaswell	UTRC	Advisor	1
Elliott Sclar	UTRC	Advisor	1
Qian Wang	UTRC	Researcher	15
Percy Casani	UTRC	Student BS Engineering, CCNY, Conway	20
Yeap Xue Bing	UTRC	Student BS Engineering, CCNY, Conway	20
Lisa Chauvet	UTRC	Student BS Engineering, CCNY, Conway	15
Medwin Chiu	UTRC	Student BS Engineering, CCNY, Conway	15
Eric Goldwyn	UTRC	PhD Candidate Planning, Columbia, King	3
Yue Duo	UTRC	MS Planning, Columbia, King	2
George Todorovic	UTRC	MS Planning, Columbia, King	1
Shuai Tang	UTRC	PhD Candidate, U Buffalo, Wang (1	50
Quanquan Chen	UTRC	PhD Candidate, Civil Eng (transp), CCNY	50
Niloofar Gharamani CCNY	UTRC	Student MS Civil Eng, CCNY hrs/wk)	15
Victor Leal-Tavares	UTRC	Visiting undergrad intern, Brazil, CCNY	100
Nathan Tavernier	UTRC	Visiting graduate intern, France, CCNY	100
Zach Silverman	UTRC	Research Asst (paid part-time)	20
Sangbeom Seo	KOTI	Seoul team leader	20
Sung Ju Jeong	KOTI	Senior Research Fellow	5
Jee-Sun Lee	KOTI	Associate Research Fellow	15
Changjin Ahn	KOTI	Researcher	50
Hong Seung Roh	KOTI	Research Fellow	5
Taihyeong Lee	KOTI	Research Fellow	5

2. EXECUTIVE SUMMARY

This report summarizes the work of the MetroFreight Center of Excellence during its first two and one half years of existence. The launch of MF took place over several months, with our first in-person team meeting at TRB 2013, VREF meeting in February 2013, and the last of the partner subcontracts set up in summer 2013. We use as our effective start date June 2013, which, at this writing, puts us at the end of the first quarter of Year 3. This report summarizes our accomplishments to date, and presents our plans for the remainder of the five year grant.

We consider our accomplishments against the stated goals of MF: to 1) improve the state of knowledge regarding urban freight problems and solutions; 2) conduct collaborative research with government and industry partners that results in the development of real-world solutions; 3) foster and facilitate tests and demonstrations of promising solutions; 4) establish urban freight education and training programs; and 5) conduct a comprehensive, multimedia outreach program.

2.1 IMPROVE THE STATE OF KNOWLEDGE

MF has established and conducted a comprehensive research program around the concept of comparative case study focused on our partner cities, Los Angeles, New York, Paris and Seoul. We developed a two phase program. The first was to generate a comparable database for each metro area and use the data to conduct a descriptive comparative analysis of freight flows and their impacts. The second is a series of research projects on five themes, again using the four metro areas as case studies. The main contributions from Phase 1 are 1) development of the data base, which has been used in several subsequent projects; 2) conceptualization, description, and testing of the metropolitan "freight landscape": spatial patterns of freight activity.

Freight landscape contributions include: 1) creation of the Urban Freight Landscape Atlas, which describes and explains spatial patterns; 2) empirical tests of the relationship between these spatial patterns, transport supply, and freight flows; and 3) development and testing of a theoretical framework to explain these relationships.

The Phase 2 research is organized around five interrelated thematic areas: 1) The role of policy from industry's perspective; 2) Last mile strategies; 3) Improving passenger/freight interactions, rail and highway; 4) Land use change dynamics, consequences, and solutions; and 5) Changing consumer and producer behavior. The first three themes address freight problems and solutions; the last two themes have a longer term focus and look at actual drivers of urban freight demand.

We anticipate making significant contributions to the state of knowledge in all of these areas. Some highlights include: 1) several studies on how the policy and regulatory environment interacts with urban freight demand showing that the imperative of getting freight to its final destination will generate safety and congestion problems when delivery facilities are lacking; 2) collection and use of new data sources to describe urban freight trip generation and flows; 3) development of simulation and analytical models to increase system efficiency and design supportive policies; 4) evaluations of freight mitigation strategies; 5) international comparative analysis of warehouse and distribution facility location trends; 6) analysis of household-based e-commerce on freight demand.

More generally, the MF project is helping to formalize urban freight as an academic field of inquiry, beyond traditional logistics and systems engineering programs.

2.2 COLLABORATIVE RESEARCH

Much of the Phase 2 research is collaborative with industry and government and aimed at real world solutions. Examples include IFSTTAR research using the Paris urban freight survey; KOTI research on parcel delivery services, KOTI research in support of the National Logistics Master Plan, UTRC research on freight deliveries at residential buildings, and IFSTTAR research on the parcel delivery industry.

2.3 FOSTER AND FACILITATE TESTS AND DEMONSTRATIONS

MetroFreight engages with industry and government partners in many ways, and MF researchers are directly involved with policy design and implementation through advisement and committee memberships. Each of the MF partners conducts outreach efforts to government and industry. These include major events such as the CITT Town Hall meeting, regular meetings with agency or industry partners to directly disseminate results of specific projects, and presentations through venues such as the US FHWA Talking Freight series. MF partners also work with agency partners to solve specific problems, such as developing plans for improving truck flows at an intermodal logistics park, and providing support for freight master plans.

MF partners have direct influence on urban freight policy through their appointments on policy committees and task forces. These include appointments on the US National Freight Advisory Committee, the California Freight Efficiency Strategy Development Team, and the Paris Sustainability Logistics Charter scientific committee.

2.4 EDUCATION AND TRAINING PROGRAMS

MF has carried out a comprehensive education and training program. The Curriculum Guide helps us to identify the current state of the art in urban freight education. The Guide, a searchable database, currently has 362 entries and is in beta testing for launching on the MF website.

Our major curriculum development effort is a graduate course in urban freight, developed and taught for the first time in spring 2015 at CCNY and USC. The course is being refined and will be taught one more time before making the curriculum available to other universities. Urban freight was the topic of a 1 week undergraduate course in Paris, and part of new curriculum for a graduate course in logistics planning and economics, also in Paris.

Attracting the next generation of researchers and professionals is accomplished by engaging students in MF research, and providing a broad array of engagement opportunities. At present there are 13 PhD students working on MF projects as part of dissertation research. In addition to seminars and participation in joint industry/agency/university workshops, students have access to internship opportunities, a mentor program, career fairs, field trips and site visits.

Professional training is a critical part of dissemination. MF has developed two short courses, one for the goods movement industry and one for policymakers; they will be piloted in Los Angeles and Paris in the coming year.

2.5 OUTREACH

Broad dissemination of MF results is essential for promoting more effective management of urban freight. The MF outreach program is built upon METRANS outreach, benefitting from the synergies of a well-developed and comprehensive program. The major outreach activity is the International Urban Freight Conference, held in 2013, and again in 2015. I-NUF has become the main venue for multidisciplinary urban freight research. This year's conference features over 120 papers and presentations, including 32 from MF researchers.

We have developed a comprehensive communications program to disseminate our work beyond the academic community. The MF website (www.metrans.org/metrofreight) is a central repository offering global access to MF research briefs and reports, data sources, publications, relevant news and timely announcements. In addition, research and education activities are shared via newsletters, events, podcasts, webinars, and videos. We have established a regular presence on social media channels, such as Facebook, Twitter, and LinkedIn. IFSTTAR publishes a MF newsletter, and the *METRANS News* includes an MF section in every issue.

2.6 VREF GOALS

In addition to the goals we set out for ourselves, VREF promotes international collaborations, and particularly collaborations between the VREF CoEs. MF team international collaborations outside of VREF CoEs include: 1) EU-US Transportation Research Symposium, 2013; 2) Urban freight volume in *Research in Transportation Business and Management* (2014), 3) Horizon 2020 CITYLAB project, 2015; 4) University of Antwerp Port Innovation Project (2014-15); 5) Last-mile workshop (2013).

Major collaborations with other CoEs include the various conferences and workshops sponsored by VREF, I-NUF 2013 and 2015, the SUFS Webinar Series, the PASI-SUFS young researcher workshop, and eight research exchanges of MF researchers, students, and other COE researchers and students. In addition, several research collaborations among the CoEs have developed, notably on the warehouse location trends research, and urban freight data research.

National collaborations generated by the CoE are extensive. Each MF partner has a large national and local network that has been enhanced by the CoE grant. Notable examples include the new Southwest Transportation Workforce Center at METRANS, new partnerships between IFSTTAR and the Paris regional planning agency, and with the Laboratory of Transport Economics of Lyon.

2.7 DEVIATIONS FROM PLAN, PROBLEMS, CHALLENGES, AND LESSONS LEARNED

There are no significant deviations from our plan, and there are no significant problems or challenges to report. We learned that regular face-to-face meetings and on the ground experiential learning are essential, and have incorporated more in-person meetings and site visits into our schedule of activities.

2.8 OVERALL IMPACTS

MF, and the VREF urban freight program more generally, has had some important impacts not captured by an enumeration of the many activities and contributions MF has accomplished to date. We identify the following impacts: 1) growing interest and awareness of urban freight within the academic and professional urban planning community; 2) strengthening of the international network of scholars across disciplines; 3) increased volume of urban freight research, which in turn attracts students and faculty and in the long-term creates a larger, more qualified next generation workforce.

In conclusion, MF has made good progress in accomplishing the goals and tasks set out in our proposal. Building on the strong base of its four partners, MF is well positioned to complete its work and continue serving as an international center for urban freight research after the termination of the CoE.

2.9 FINANCIAL SUMMARY

Our use of grant funds is in line with our progress on the MetroFreight scope of work. We are ahead of target in our match funding commitment, and have greatly exceeded our estimates of potential additional funding. MF has benefitted from a larger urban freight research portfolio, as well as from the core infrastructure provided by METRANS, UTRC, IFSTTAR, and KOTI.

3. MID-TERM REPORT

3.1 INTRODUCTION AND BACKGROUND

The emergence of urban freight as a multidisciplinary field of study began at the turn of this century. The Institute for City Logistics (ICL) was established in Kyoto, Japan in 1999 to serve as a center for urban freight research under the leadership of Prof. Eiichi Taniguchi. Taniguchi and colleagues developed the concept of city logistics as a specialized subfield of logistics. ICL held the first International Conference on City Logistics (ICCL) in 1999, and the conference, together with the research it generated, led to a growing community of researchers, first focused on logistics and operations research, and later expanding to economics and other allied fields.

Also in 1999, the METRANS Transportation Center launched a multidisciplinary urban freight research agenda focusing on the role of international trade in cities. The METRANS group and its affiliates addressed the problems of trade nodes: the overlay of global trade flows on local freight supply and demand, and the dependence of global trade on the performance of hinterland connections. METRANS held the first National Urban Freight Conference in 2006. NUF (now I-NUF) brought together a more diverse group of researchers drawn from economics, urban planning, public policy, as well as systems engineering.

In Europe, starting in the 1990s, several national (The Netherlands, Germany, France and the UK) and European programs identified urban freight as an area of research. Framework Programs at the EU level funded case studies, data collection efforts and program evaluations. They contributed to the development and consolidation of a network of academic teams interested in urban freight issues (see for example www.bestufs.net).

There was little overlap between these groups. The METRANS/NUF group was primarily US and drawn from various transportation engineering or planning programs; ICL was primarily Asia and Europe and drawn primarily from business and management programs. European programs remained strictly European and focused on local solutions and promotion of best practices. Integration began with personal encounters at the large international conferences such as WCTR and TRB.

The VREF solicitation for a Centre of Excellence in Urban Freight came at a propitious time, because the international network of urban freight researchers was just beginning. The grants to MetroFreight (MF) and Sustainable Urban Freight Systems (SUFS), and more recently to the Urban Freight Platform (UFP), provide the critical support needed to fund an academic research agenda and establish a strong international research network.

Although METRANS and its MF partners were already recognized as major centers for urban freight research when the CoE award was received, the award has enabled us to develop a closely integrated international network of multidisciplinary researchers that together are making significant contributions to both the academic subfield and to professional practice. Each partner came with its own network of researchers and key stakeholders, public and private. MF is an illustration of the sum being stronger than its parts; the combined strengths of METRANS, UTRC, IFSTTAR, and KOTI have resulted in significant contributions to defining the field, articulating an urban freight research agenda, and disseminating results and best practices.

3.2 THE START-UP PROCESS

The launch of MetroFreight began with a kick-off meeting with VREF sponsors in Gothenburg at the end of February 2013. Some members of MF had their first in-person meeting earlier at the 2013 TRB meeting in Washington DC. The contract processing took quite some time, with the master contract set up in May 2013 at USC, and the subcontracts being issued after the master contract was in place. The last of the subcontracts was finalized in September 2013. The long contracting process delayed the start of the major work of Year 1. We use as the effective approximate start date June 1, 2013, when funded activity began at USC.

Start-up of MF benefitted from the existing infrastructure of the METRANS Transportation Center. Basic administration of MF was performed by a graduate student and METRANS staff until Catherine Showalter, Project Manager, joined USC in February 2014. MF administration, including financial management, media and communications, continue to be supported by METRANS staff members, who are funded from other sources.

Managing an efficient and effective international organization requires a transparent management structure, frequent and regular communications, and a secure method for data/information sharing. Team leaders form the management team; they are responsible for all communications and deliverables of their team. Team leaders meet monthly via conference call, despite the large time differences. Each conference call has an agenda. Minutes are recorded, and action items are identified and tracked. Given the importance of face-to-face communication, team leaders and researchers meet "opportunistically" at major conferences, and have committed to site meetings at each metro location. A MF Dropbox site (and protocols) was set up for sharing all project related data and documents; Dropbox is managed by the METRANS team.

A MF logo was created to brand all activities and products generated from the grant. The public launch of the CoE took place at a reception preceding the I-NUF conference in October 2013. A new MF website (www.metrans.org/metrofreight) was designed and launched in 2014. Also in 2014 the MF IFSTTAR newsletter and the MF news section of *METRANS News* were begun.

3.3 MAIN RESEARCH ACHIEVEMENTS AND THEIR IMPACT

The MetroFreight research program is organized around the concept of comparative case study. We selected four of the world's leading metro areas (Los Angeles, New York, Paris and Seoul), arguing that they are appropriate case studies due to their size, role as major international trade hubs, institutional complexity, degree of urban freight problems, role as policy innovators, and our previously established relationships with public and private stakeholders. We developed a two phase program. The first phase was to generate a comparable database for each metro area and use the data to conduct a descriptive comparative analysis of freight flows and their impacts. The intent was to generate sufficient comparable data to support comparative research in later phases. The second phase is a series of research projects on five themes, again using the four metro areas as case studies.

3.3.1 Phase 1 Research: Understanding the urban freight problem

The Phase 1 research began with development of a protocol for data collection, identifying units of measurement and unique definitions for each data element. Five categories of data were identified: jurisdictional, infrastructure, land use, flows, and policy. The availability of different types of data varied greatly across our metro areas, and data availability ultimately determined the scope of the comparative analysis (see Report 1A, Building the Database, for a description of data protocols and data collected). The Phase 1 effort has generated two main benefits. It created the data necessary for later projects, and it motivated our freight landscape research.

3.3.1.1 Support for MF research projects

The data collection effort resulted in a rich database for Los Angeles which has supported several additional research projects. The Los Angeles (LA) warehouse and distribution center research is based on the data

(Giuliano, 4.1b; Kang dissertation; other projects funded by METRANS). The LA simulation model (Ioannou, 1.2a) shares much of the data. The LA team continues to expand the data base, and has now constructed similar data for three California metro areas.

In Paris, the pool of data collected for Phase 1 also benefited from the *Paris urban freight survey* which took place just before the CoE started. Adeline Heitz, PhD student from the Paris team, has been using the Phase 1 data extensively, especially socio-demographic data (population, employment, warehouses, transport networks).

Analysis for project 3.2.a (Conway) relied on a number of datasets compiled in Phase 1. New York City (NYC) parking violation locations were mapped to the local street network. Land use data was used to examine activity types in problem parking areas; this information was critical for field data collection site selection. Bicycle-involved accidents were also mapped to the local street network, the truck network, and the bicycle network. Employment data by NAICs sector was also used to approximate freight activity in locations of bicycle accidents involving and non-involving commercial vehicles.

3.3.1.2 Developing the Freight Landscape Concept

Perhaps the most significant achievement of the data collection effort to date is the conceptualization, description, and testing of the metropolitan "freight landscape": spatial patterns of freight activity. The concept builds on Dablanc and Rodrigue's city logistics typology, which categorizes cities around the world according to volume of trade, GDP, and transport infrastructure as well as more qualitative attributes. Building on the city typology, we examine whether basic measures of spatial form – population and employment distributions – can differentiate cities with respect to patterns of freight activity. We are creating the Urban Freight Landscape Atlas, which maps each metro area in the same units, the same scale, and the closest possible spatial units. The purpose is to describe spatial patterns and categorize them based on simple measures of urban form and transport network characteristics. We have discovered striking differences across our four metro areas with respect to spatial correlation of population and employment density, from very high convergence in Paris, to relative dispersion in Los Angeles, while New York and Seoul have more intermediate patterns.

In part responding to the lack of freight data at the sub-metropolitan level, and in part to the absence of a theoretical framework for understanding urban freight, a second aspect of our work is to test whether simple measures of urban form and transport supply are correlated with observed freight activity. If so, we may then impute freight activity, despite the absence of freight data. We have estimated statistical models using data from Los Angeles to test our hypothesis, and results are encouraging. We collected the same data for the San Francisco metro area, and got consistent results. The main observation is that truck traffic is correlated with population and employment mix and density, consistent with anecdotal observation of more intense truck activity in city cores. This work has been presented at several conferences, and the first paper is under review (Giuliano, Rodrigue, Dablanc, Kang, 1C The Urban Freight Landscape).

Finally the urban freight landscape work has motivated investigation of a theoretical framework based in urban economics. The research continues under Theme 4 in Phase 2. We have developed arguments to explain the relationship between freight activity and development density, which is in turn a proxy for land value. We will estimate density gradients for development density, freight flows, and estimated freight trip generation, in order to test whether freight activity may be modeled as a function of land value, and whether land value effects are the same or different from that of population or employment distributions. Together this work addresses one of the major research gaps in urban freight: the lack of systematic understanding of freight and spatial relationships. Adeline Heitz, from the Paris team, will conduct a similar analysis for Paris, directly inspired by work from the LA team.

3.3.2 Phase 2 Research: Thematic research program

For Year 2 and following, our research is organized around five interrelated thematic areas: 1) The role of policy from industry's perspective; 2) Last mile strategies; 3) Improving passenger/freight interactions, rail and

highway; 4) Land use change dynamics, consequences, and solutions; and 5) Changing consumer and producer behavior. The first three themes address freight problems and solutions; the last two themes have a longer term focus and look at actual drivers of urban freight demand, which could lead to strategies with ultimately more impact. Our research program is organized to carry themes across the four metro areas so that by the end of the CoE grant we have generated insights on the similarities and differences of freight problems and freight dynamic across very different urban/metropolitan environments.

We have a total of 25 Phase 2 projects in progress or recently completed. Due to space limitations, it is not possible to describe each of the projects. Project descriptions and reports for the completed projects are available on the MF website, http://www.metrans.org/research-projects/metrofreight. Here we provide a summary of the main themes and some results. In considering the research to date as a whole, there is substantial overlap between the thematic areas. Therefore we present the research here according to the topic areas as they have emerged over the past two years.

3.3.2.1 Policy – Freight interactions

Urban freight dynamics take place in the context of a highly regulated urban environment. Land use policy determines where residential, commercial or industrial activity locates. Street capacity, parking availability, delivery windows and truck routes are the outcome of public policy decisions. Building codes dictate whether loading bays or other off-street facilities exist. These decisions, made over decades (or centuries) impact the on the ground freight outcomes we observe.

Conflicts over curb and road space are illustrated in a study of the relationship between truck deliveries and residential building size in New York City (King, 1.1.b). The increased demand for home deliveries generates more truck delivery trips on streets where loading zones are limited. King finds that curb space is so limited that trucks double park in the traffic lanes throughout the day. A similar study of parking supply and freight delivery demand in Paris (Dablanc, Beziat, 3.2.d) demonstrates a similar problem, although the degree of illegal parking is not explained simply by lack of parking supply.

Another New York City study (Conway, 3.2.a) examines the impacts of the City's new policy of adding bike lanes to major streets on truck traffic, parking and safety, finding that bicycle-involved crashes are more frequent on truck routes with protected bike lanes, likely due to the high demand for freight deliveries and associated illegal parking. Dablanc (2.2a) evaluated the impacts of Low Emissions Zone (LEZ) policies in selected European cities, finding not only that the zones resulted in environmental benefits from the use of cleaner vehicles, but that the regulation incentivized greater efficiency in freight deliveries. This research is contributing to a better understanding of how policies affect freight behavior, and will contribute to better, more effective policy design.

3.3.2.2 Data and models

Several projects focus on using new data sources, collecting data, and developing new tools for analysis. Perhaps the most notable data source is the Paris urban freight survey data, which provides detailed information on van and truck movements and goods mobility within the Paris region. The Paris data is being used to estimate freight trip generation rates and a freight (truck) O-D matrix for Paris (Dablanc and Beziat 2.3.a). It is being combined with household survey data to estimate congestion impacts of freight on passengers, and passengers on freight (Dablanc and Beziat 3.2.d).

KOTI, in cooperation with industry, has collected data on parcel freight in Seoul, generated a parcel freight OD matrix, and has examined the relationship between parcel freight demand and consumer characteristics (Lee, 1.1d). KOTI is also analyzing logistics problems in Korean cities and developing long term management policies and action plans, in partnership with local governments and industry (Seo, 2.1.d; Lee, 3.2.c)

Wang (2.1.b) is examining the performance of the transport network with respect to freight demand in New York.

Two long-term modeling projects are taking place. Ioannou (1.2.a) is developing a goods movement transport

simulation model, using data on Los Angeles collected in Phase 1. The goal of the research is to develop a simulation model for testing outcomes of policy scenarios. Work to date includes: improvement of the terminal operations model, development of a microsimulation model for the local area, and development of a macro-simulation model for the region. Dessouky (3.1.a) is using the freight rail network of Los Angeles to develop dynamic scheduling models to increase capacity of the freight rail network. The research includes developing new solution methods for complex optimization problems. New, more efficient scheduling methods are needed in order to increase rail mode share.

3.3.2.3 Alternative fuels or modes

A widely proposed and employed strategy for addressing the environmental impacts of urban freight is the use of alternative fuels or modes. Examples include clean fuel requirements, LEZs, mode shifts from truck to rail or water, and use of non-motorized vehicles. Our understanding of the economic viability of these strategies, or where and why they work or don't work, is quite limited. Under the themes of Last Mile and Freight-Passenger Interactions, we are conducting several studies of alternative fuels and modes that should provide better understanding of potential niche and mainstream markets.

In addition to the LEZ study, Dablanc and Heitz (2.1.c) have examined two alternative mode delivery services, one a barge plus cargo cycle service, the other a cargo cycle short distance delivery service. The study addressed both economic costs and environmental benefits, finding that although estimated CO_2 and pollution reduction benefits were significant, the services are not financially viable. Thus absent subsidies, these services are not replicable or scalable. Another Paris study (Koning, 3.2.b) takes a broader view, and examines the use of non-motorized modes for goods movement by both consumers and delivery services. The market for non-motorized (cycle) delivery services has greatly increased since 2001. The authors estimate the emissions reductions associated with this increase. They suggest that increasing bicycle use by consumers (shopping by bike rather than by car) could have similar environmental benefits.

Miller (2.1.a) is working on a more unusual concept: eliminating solid waste collection by trucks, and instead constructing a system of underground or above grade pneumatic tubes for solid waste disposal. Using New York City as a case study, Miller demonstrated the feasibility of the concept, and estimated that the system would reduce truck travel by 20,000 km annually.

3.3.2.4 Land use

We have described the Freight Landscape work in section 3.3.1.2. We are exploring other aspects of the relationship between city logistics and urban form. All of this work is aimed at increasing our understanding of spatial structure and the spatial organization of urban freight. Such an understanding is critical to effectively addressing urban freight problems.

The location trends of warehouse and distribution (WDC) facilities are a major issue. Work by Dablanc and others has suggested that WDCs are decentralizing, and as a result, it is expected that truck VKT is increasing in metro areas. However, evidence on decentralization is mixed, and little is known regarding impacts on truck travel. Dablanc and Heitz (4.1.d) examined WDC spatial trends in the Paris region, controlling for facility type. They found that WDCs oriented to parcel delivery seek more central locations, while WDCs oriented to other retail or industrial distribution are more likely to decentralize. A comparison across several European metro areas and regions suggests that spatial shifts in location may be associated with metropolitan form (monocentric or polycentric), and extent of land use regulation.

Giuliano and Kang (4.1.d) have examined the question of measurement. If changes in WDC location are consistent with overall changes in population and employment location, it is not clear that decentralization would lead to more truck travel. A series of spatial measures were developed, and spatial trends for four California metro areas were analyzed. Only the LA region shows a consistent trend of decentralization, which may be explained by the LA region's function as international trade hub for the US.

Rodrigue (4.1.c) addresses a different question: are there differences in city vs suburban logistics patterns?

Rodrigue argues that suburban logistics is fundamentally different, and public policy may reinforce these differences. For example, truck tolls and off-hours deliveries, strategies to address city logistics problems, may differentiate distribution channels, increasing the difference between city and suburban logistics. The question is how far this expected divergence can grow and to what extent higher densities in central areas are the drivers for this divergence.

3.3.2.5 Consumer behavior change and its impacts

Urban freight dynamics is a function of supply and demand. On the demand side, retail distribution is a function of consumer demand: where, when and how frequently people purchase goods and services. The rapid rise in e-commerce has greatly increased the volume of parcel deliveries, and has increased the number of delivery destinations, resulting in a more dispersed and less efficient delivery system. Recent trends towards same day deliveries, and subscription services (e.g. Amazon Prime) that incentivize multiple small purchases are likely to reinforce these trends.

Much of our MF work is focused on e-commerce and how deliveries may be better managed. In addition to the KOTI studies described above, Dablanc and Morganti (5.2.a) have explored alternative delivery mechanisms for home-based shopping in the Paris region. They examine the spatial distribution of pickup point (PP) services, and find that location is related to population density, with a good overall access to PPs today even in remote areas. PP services generate a change in the distribution chain as loads are consolidated for delivery to PP stations. It is worth noting that the increased demand for home deliveries may create larger markets for non-motorized services such as cargo cycles. This is a question for further study.

Conway and Rodrigue (5.1.a) are conducting an exploratory study of home-based deliveries in New York City. They are conducting interviews with consumers, building managers, and shippers to better understand how the last mile operates in a very dense urban environment. Strategies for managing receiving and deliveries within buildings are part of the research. Observations at the building level will help develop some understanding of the constraints of home deliveries, including time of day, size of deliveries, duration of delivery and parking needs. The team will evaluate the impact of these flows on demand for local infrastructure and examine the policy implications for managing urban space.

3.3.3 Scientific Impact

The MF project is helping formalize city logistics as an academic field of enquiry. Particularly in North America, city logistics has been fragmented and focused on a narrow set of issues. MF enabled the creation of a critical mass of scholars from different fields who are articulating the main concepts and principles of city logistics, from a comparative perspective. This obviously builds upon previous work, particularly from Japanese and European scholars. Freight in North America has long been an active field of research and practice, but not on the subject of city logistics. Urban freight transportation issues remained relatively absent. The discipline is now being recognized by the scientific community and practitioners as well. For European urban freight research, which tends to be focused on demonstrations, MF brings a framework for understanding patterns and structure. Also, it provided an opportunity for the Paris urban freight survey to be acknowledged outside of French borders.

More specifically, we see our freight and land use research – freight landscape, warehousing and distribution patterns, city and suburban logistics – as having promise as a significant contribution through development of theory and careful empirical comparative analysis. A second contribution is in policies, regulations, and their impacts. By considering costs, benefits, and unintended consequences across a broad range of strategies and urban environments, we contribute to better and more effective policy design. Finally, our work on e-commerce, again across very different urban environments and from different disciplinary perspectives, fills a big gap in the existing literature.

For impacts of MF research projects on practitioners and industry, see Section 3.8.

3.4 MAIN EDUCATIONAL ACHIEVEMENTS AND THEIR IMPACT

Our education strategy has the following objectives: 1) increase availability and use of urban freight curriculum in transportation graduate programs, 2) increase number of transportation graduate students engaged in urban freight education and research; 3) offer professional training to public and private practitioners.

3.4.1 Urban freight curriculum

3.4.1.1 MetroFreight Curriculum Guide

The MetroFreight Curriculum Guide is the result of an international scan of curricular materials, readings, case studies, media, exercises and examples of experiential learning. This project helps us identify the current state of the art in urban freight education and gaps in the curriculum. Our survey revealed that urban freight is almost invisible in post-secondary education programs, including graduate programs. The database is a repository of information that can be used by curriculum designers, researchers, practitioners and governmental agencies. The Guide currently has 362 entries. All sources have been cross-referenced and sorted by topic, author, year of publication, title, type of material, and target audience. The Guide is designed to be a living document. It was created as an excel spreadsheet but is currently being migrated to the MF website where users will be able to search entries in a more user-friendly web-based environment. This will also facilitate database updates as more materials become available.

3.4.1.2 Textbooks and other curriculum

The MF partners have authored some of the most widely used texts in transport geography and planning, and have incorporated urban freight both in texts and courses. The Geography of Transport Systems, edited by J-P Rodrigue, is the world's leading transportation geography textbook. The 4th edition (forthcoming, 2016) will include additional material about freight transportation. All the material is also freely available online. Several chapters include topics of relevance to city logistics. Over the following year, the web site will be migrated to a content management platform (such as WordPress) to make the material easier to access and update.

The *Geography of Urban Transportation*, edited by G. Giuliano and S. Hanson, is one of the most widely used textbooks for graduate and undergraduate courses in urban planning, geography, and transport engineering in North America. The forthcoming 4th edition includes a new chapter on urban freight by Dablanc and Rodrigue.

<u>*Paris: Undergraduate Course on Urban Freight*</u>. A one week introductory course on urban freight was conducted in fall 2014 at University of Paris-East. It included the following topics: socio-economic trends, consumption and production patterns, spatial trends explaining urban freight; urban freight transport and logistics operators; data collection and modeling; urban freight policies; innovations and technologies in city logistics. The Paris MF team participates in teaching the course.

<u>*Paris: Graduate Course in Logistics Planning and Economics:*</u> This course, offered at Ecole des Ponts-Paris-Tech (engineering school of the University of Paris-East), includes a new urban freight curriculum as of spring 2015. Topics include spatial trends of freight in metropolitan areas; urban freight data collection and modeling; and international comparisons. The Paris MF team participates in teaching the course.

Several MF faculty incorporate urban freight in transport courses. At Columbia University, David King discusses street space, curb allocation and goods movement in Transportation and Land Use Planning course (PLA 4208), taught each spring. He also spends approximately one week on freight. At USC, Gen Giuliano includes one week on urban freight in the graduate transportation core course. At the State University of New York at Buffalo, Qian Wang discusses behavior analysis for freight transportation in Discrete Choice Analysis (CIE 555), taught each spring.

3.4.1.3 Graduate Course on Urban Freight: City Logistics

We have developed an interdisciplinary urban freight graduate course offered in distance format. The course is organized around three themes: (1) Freight and the City; (2) Issues and Challenges of City Logistics; and (3) City Logistics in Practice. "Freight and the City" provides background on city logistics and its evolution in response

to globalization. Literature is drawn from urban geography, planning, supply chain management, and economics. "Issues and Challenges" discusses freight stakeholders, impacts of urban freight, and mitigation strategies. "City Logistics in Practice" addresses data and modeling, and case studies of best practices. The course was piloted at the City University of New York in spring 2015, with participation of graduate students at the University of Southern California by video via Adobe Connect. In total, 14 students participated: 10 Civil engineering undergraduate, Masters, and PhD students, and 4 urban planning Masters and PhD students. The course will be refined in the coming year, and the course content will be made available for use at other universities.

This effort was to our knowledge the first attempt to outline, develop, and implement a full-semester curriculum covering the core concepts of city logistics that could be incorporated into graduate programs in diverse disciplines. Course content was drawn from a variety of city logistics sources, including multimedia content developed by MF researchers, by other VREF partners including SUFS and Urban Freight Platform, and by the growing community of international urban freight researchers. The video-based format permitted students to learn from and communicate directly with international experts. Including students from two very different US cities and academic programs enriched class discussions, given their diverse backgrounds and difference in local knowledge. A class of students from diverse fields enabled faculty to identify differences and gaps in background knowledge between engineering and planning students; these will be addressed in future iterations of the course for public distribution.

3.4.2 Graduate student engagement

MF research generates interest, supports students, and attracts students to urban freight research and training. As Table 1.4 illustrates, there are many students engaged in MF research and other activities.

3.4.2.1 Los Angeles

At USC, MF has helped to raise the visibility of the urban planning program as unique in developing a freight research agenda in urban planning, and PhD applicants interested in urban freight are beginning to self-select into the program. Sanggyun Kang's dissertation research seeks to explain spatial trends in WDC location in large US metropolitan areas. Quan Yuan is developing a dissertation proposal on the impacts of high volume freight corridors on local communities. Nate Hutson is working on the relationships between warehouse location, rents, and drayage costs. In engineering, Lunce Fu's dissertation (Industrial and Systems Engineering) research focuses on improving rail scheduling and routing through dynamic headway control. Yihan Zhang (Electrical Engineering – Systems) is working on simulation models and combined lane change and variable speed control algorithms and impact on trucks. Yanbo Zhao (EE-S) is working on traffic light control with truck priority and load balancing.

At the masters level, increasing numbers of planning and engineering students are drawn into urban freight due to the expansion of course offerings; USC offers graduate courses in port operations, port governance, and urban freight. Graduated students have been placed at the Port of Los Angeles, Port of Long Beach, and Port Authority of New York and New Jersey.

METRANS provides numerous student engagement and enrichment activities. These include an internship database, assistance and referral; professional development activities, such as resume books, facilitated and sponsored attendance at professional conferences and events, and career counseling; scholarship referral and application assistance; Mentor Program, which matches students with active transportation professionals; monthly Lunch with a Practitioner series; career fairs and career nights both on and off campus; field trips; site visits; and direct employment at the center. As a result of these activities, over the past year 34 USC students were placed in transportation related internships, 20 internships lead directly to permanent employment, and over 20 students were paired with professional mentors.

At CSULB, the masters degree program most closely related to urban freight transitioned from a multidisciplinary Master of Arts program housed in the department of economics to a more quantitative but still interdisciplinary Masters of Science degree in supply chain management housed in the business school.

The MS-SCM was launched in fall 2015. Most of the student participation in MF at CSULB is drawn from the department of economics, which has a strong transportation economics concentration within the masters degree.

3.4.2.2 New York

The New York UTRC MF consortium includes CCNY, Columbia University, Hofstra University, and University at Buffalo. Student engagement at UTRC includes PhD and masters students. Quanquan Chen, CCNY, is examining freight access to residential land uses in NYC, identifying impacts of limited access on surrounding streets, and developing policy alternatives to address resulting challenges. Masters students have worked with David King (see Table 1.4) Undergraduates have contributed to Alison Conway's projects. See Table 1.4 for names of students at all levels: Ph.D, masters, and undergraduate.

3.4.2.3 Paris

In addition to the courses described above, MF research at IFSTTAR includes the work of four PhD students. Adrien Beziat's research quantifies the impact of road congestion associated with urban freight. It deals with road congestion at both microscopic (impact of freight vehicle parking at the street level) and macroscopic (impact of freight vehicle movement in OD zones). Beziat is using data from the Paris Region Urban Freight Survey. Adeline Heitz is analyzing the evolution of warehouse locations in metropolitan areas at different scales (city center, region, "megaregion"...). Comparisons between Paris, Montreal, and Gothenburg show the existence of different forms of logistic development in metropolitan areas. Pierre Launay is examining sub-contracting in the urban freight transport business, with a special focus on Paris. Pierre Camilleri is examining the use of electric commercial vehicles for deliveries in large European cities, with a special focus on Paris.

MF and VREF funding have also promoted exchanges across the broader VREF network, greatly increasing access to topical experts such as Dablanc on warehouse decentralization, Holguin-Veras on off-hours deliveries, and Brown on local freight planning. See section 3.6 for details.

3.4.3 Professional training

A major goal of VREF is to move research to practice in order to achieve a sustainable metropolitan transportation system. Training and outreach are critical to achieving this goal. MF has taken advantage of the partners' rich industry networks and expertise in professional training.

3.4.3.1 Short courses

Two short courses are in the final stage of development, one targeted to elected and public officials, the other to industry. The courses are being developed around local conditions, interests, and concerns. Over the course of the grant period, training courses will be extended to New York and Seoul, and be made available to the international professional community.

The Paris test course will be offered December 2015. It will target French urban planners, transport experts, elected officials, and practitioners. The curriculum is being designed by Laetitia Dablanc and Tom O'Brien. Lyon-based Interface Transport, which has a long history working with local officials and practitioners on urban freight issues, has been engaged as course facilitator. The workshop will be free of charge for participants. The class will be limited to 20 people in order to allow for a more dynamic project-based learning approach. This will also facilitate the development of a true cohort of urban freight professionals and encourage substantive peer exchanges. The workshop will be an opportunity to provide information to participants on new French legislation which will have an impact on urban freight policies. It will also serve as an opportunity to inform French cities about the results of the recent Paris and Bordeaux urban freight surveys.

The Los Angeles course will focus on passenger-freight interactions within the greater LA metropolitan area and target industry professionals to help them better understand planning processes and constraints. It will use as its foundation a similar course being developed by USC and CSULB for regional and municipal level planners focusing on the challenges of planning for both freight and passenger mobility in a multi-jurisdictional environment. We expect to offer the LA course in 2016.

For each of the above, we leverage other efforts of consortium members to test materials as well as to extend the reach of our work.

3.4.3.2 Allied professional development activities

In addition to the professional education activities directly funded by MF, allied activities contribute to the overall presence and visibility of urban freight among industry and government practitioners. Examples include 1) the addition of urban freight to the Goods Movement Academy that the CSULB Center for International Trade (CITT) offers twice annually to planners and engineers from the California Department of Transportation (Caltrans), and 2) a high school teacher training course to incorporate port and supply chain issues into secondary curriculum that includes urban freight. CITT is also partnering with Kuehne+Kagel in a pre-apprenticeship program for students in the non-credit Global Logistics Specialist program.

Thomas O'Brien is on the leadership team of the Southern CA Roundtable of the Council of Supply Chain Management Professionals (CSCMP), and is working with CSCMP on development and pilot testing of curricular materials for entry-level certifications in supply chain management and freight operations.

Jean-Paul Rodrigue taught a 35 hour graduate course titled "Hinterland Transport and Logistics" at Chongqing University in Chongqing, China during May 2013. Sangboem Seo participated in the Logistics CEO Education Program at Chungwoon University. Qian Wang gave several lectures on urban freight transportation systems at Tongji University and Beijing University of Technology in China in June 2014.

3.5 OTHER ACHIEVEMENTS

Broad dissemination of MF research results is essential for promoting more effective management of urban freight. The MF outreach program is built upon METRANS outreach, benefitting from the synergies of a well-developed and comprehensive program.

3.5.1 International Urban Freight Conference

The MF CoE was officially launched at the 2013 International Urban Freight Conference held in Long Beach, CA. It featured special VREF CoE sessions for MF and SUFS; a total of 15 CoE related papers were presented. I-NUF provided one of the early networking opportunities for CoE researchers and students. MF held a team meeting, and VREF representatives held a meeting with SUFS and MF leadership. The 2013 conference also led to a volume of *Research in Transportation Business and Management,* entitled "Urban Freight" and including several papers from CoE contributors (*RTBM* 11, 2014).

I-NUF will be held in October 2015, again in Long Beach. This year a total of 58 papers from CoE researchers will be presented in 8 special sessions and other sessions, demonstrating the impact VREF has had in stimulating urban freight research. In addition to providing a venue for networking among MF, SUFS, and UFP, I-NUF is attracting the larger urban freight community. Two TRB committees (Urban Freight, Intermodal Freight) will hold their mid-year meetings at I-NUF. The TRB Freight and Marine Young Members Council will hold its mid-year meeting, and the ASCE Transportation and Development Institute's Freight and Logistics Committee will also meet and sponsor a session.

3.5.2 Special sessions at conferences

The MF team, under the leadership of Laetitia Dablanc, organized a "MetroFreight day" at the Transport Research Arena (TRA) European conference in Paris-La Defense in April 14-17, 2014. Conference papers were presented by Dablanc, Rodrigue, Heitz, Beziat, Morganti, Dessouky, Giuliano, Seo, and Lee. MF day included a morning of site visits of major urban freight innovations, and an afternoon of presentations of MF research highlights and a round-table with City of Paris and Ile-de-France Region practitioners.

We plan to have a significant presence at the 2016 WCTR (World Conference on Transport Research) in Shanghai. Twelve papers will be presented by the MF team. In conjunction with WCTR, the team will meet for a site visit in Seoul. MF researchers have presented at major conferences around the world, including 2013

WCTR, Mobil, TUM 2014, ASRDLF 2015, TRB 2014 and 2015, ICCL 2014 and 2015; ACSP 2014, ITE 2014, and Korea Logistics Society.

3.5.3 Multimedia communications

We have developed a comprehensive communications program to disseminate our work beyond the academic community. The MF website (www.metrans.org/metrofreight) is a central repository offering global access to MF research briefs and reports, data sources, publications, relevant news and timely announcements. We post information on urban freight research and activities from SUFS, UFP, and other sources. The interactive Curriculum Database is in beta testing for the website. We are launching the *TRANS-Blog*, which will provide information and perspectives on urban transport issues and policies. In addition, research and education activities are shared via newsletters, events, podcasts, webinars, and videos. We have established a regular presence on social media channels, such as Facebook, Twitter, and LinkedIn. IFSTTAR publishes a MF newsletter, and the *METRANS News* includes an MF section in every issue.

3.6 INTERNATIONAL COLLABORATIONS GENERATED BY THE CoE GRANT

As noted in Section 3.1, establishment of the VREF CoEs in urban freight came at a time when the three main clusters of researchers were just beginning to interact. Over the past two years, VREF funding has fostered more participation in national and international conferences, more frequent specialized conferences, and more cross-institution research partnerships.

The primary international collaboration generated by the CoE grant is MF itself. Without the CoE funding, the research exchanges within the partnership would not be happening. Thus the best measure of collaboration is the performance of the MF network. The second set of international collaborations is with the other CoEs, and the broader network of urban freight researchers. Some examples of broader collaborations include:

- *EU-US Transportation Research Symposium*: The European Commission, US Department of Transportation, and Transportation Research Board entered into an agreement to conduct a series of four symposia. The first symposium, City Logistics Research: A "Transatlantic Perspective" took place in Washington DC in May 2013. Laetitia Dablanc and Genevieve Giuliano were part of the symposium planning committee, and wrote one of the symposium white papers. The other was written by Michael Browne and Anne Goodchild. Additional presenters and participants from the VREF networks included Miguel Jaller, Jack Levis, Jean-Paul Rodrigue, Thomas O'Brien, and Jose Holguin-Veras.
- *Urban Freight volume* in *Research in Transportation Business and Management*: Genevieve Giuliano edited a volume, "Managing freight in urban areas," the first journal issue devoted entirely to urban freight (RTBM, 2014). The volume includes nine papers from authors representing eight countries.
- *Horizon 2020 CITYLAB*: The Horizon 2020 CITYLAB project (http://www.citylab-project.eu) was launched May 2015, looking at data collection on trends impacting urban freight in Europe as well as setting up seven demonstration projects in major partner cities. The CITYLAB consortium is led by TOI of Norway and includes 26 member institutions and companies. MF and SUFS formally supported the consortium application and helped during the project prep phase in 2014-2015. This support was an important element in the consortium's success in the competition. CITYLAB will have a duration of three years.
- *University of Antwerp Port Innovation Project*: Through grants from BNP Paribas, the University of Antwerp has organized a collaborative study of port innovation around the world. Members include University of the Aegean, University of Genova, Kuhne Logistics University, Technical University of Lisbon, Nanyang University of Technology, and METRANS/MetroFreight. A set of 73 case studies were used to categorize the types of port innovations, the innovation process, and outcomes. Results have been presented at conferences and published in papers and reports.

- *Technical University of Dortmund logistics group*: As the work of MF researchers has become more visible, more researchers are reaching out to engage in information exchange and potential research collaborations. Uwe Clausen (Dortmund, Institute of Transport Logistics) has led an effort to develop an interdisciplinary collaboration on production, logistics and traffic. The second conference was held in July 2015. VREF related members of the scientific committee included Michael Browne, Laetitia Dablanc, Genevieve Giuliano, and Johan Woxenius; papers were presented by Sonke Behrends and Genevieve Giuliano.
- *Last Mile Workshop:* UTRC organized a workshop on last mile issues on October 5, 2013, sponsored by New York State Energy Research and Development Authority and the New York State DOT. It was co-organized with researchers from the Technical University of Lisbon, Portugal, and included international presenters from Portugal, Paris, Brussels, and the Netherlands, including Hans Quak of TNO (SUFS).
- *International Forums:* Jean-Paul Rodrigue continues to sit of the Global Agenda Council on the Future of Manufacturing of the World Economic Forum. The focus on the council is on the changes in global manufacturing and their impacts on the economy and society.

3.7 NETWORKING AND COLLABORATIONS WITH OTHER VREF-CoEs

Collaborations with other VREF CoEs began from the start of the grants. The PI of SUFS, Jose Holguin-Veras and MF PI Genevieve Giuliano are long-time colleagues and were collaborators before receiving the CoE grants. In fact, Giuliano and Holguin-Veras joined in a proposal to establish a USDOT University Transportation Center focused on urban freight in 2011. Members of the Holguin-Veras group have been active participants in the I-NUF conferences, and there is a great deal of overlap in research collaborations across the two groups. Establishment of the UFP at Chalmers further expanded the VREF collaboration. In addition to the urban freight groups, MF includes Elliot Sclar (PI, Columbia University CoE on Urban Sustainable Development) as an advisor. This section describes collaborations across the following dimensions: conferences and other outreach, student enrichment, research exchanges, and research collaborations. It bears noting that VREF support of networking via sponsoring events and exchanges has played a critical role in the development of these collaborations.

3.7.1 Conferences and other outreach

3.7.1.1 October 2013, International Urban Freight Conference

MF and SUFS research was featured for the first time at the 2013 International Urban Freight Conference, organized by the METRANS Transportation Center. Four special sessions were arranged for MF and SUFS; 15 MF papers from 11 authors and 11 SUFS papers from 5 authors were presented.

3.7.1.2 October 2014, VREF CoEs Conference

VREF sponsored a CoE wide workshop in New York City, entitled "Transforming Access, Mobility and Delivery in Cities – Turning Knowledge into Action." The conference was hosted by the Columbia University CoE, and it was held jointly with a special PhD student exchange. Several members of MF attended the conference. David King and Alison Conway served as discussants, Laetitia Dablanc served as session facilitator, and Genevieve Giuliano served as panelist.

3.7.1.3 March 2015, VREF Conference on Urban Freight: Planning for Tomorrow and Delivering Today

A VREF sponsored urban freight conference was held in Gothenburg during March 5-6, 2015 and organized by UFP. MF presenters included Giuliano and Dablanc. The mission of the Conference was to look into issues that are not usually addressed within the context of urban freight and to talk to stakeholders that are not usually involved in discussions about urban freight – in order to find new ideas and inspiration to address urban freight transport.

3.7.1.4 September 2015, UTRC/SUFS Workshop

This workshop, *Improving Freight Systems in Metropolitan Areas: From New York City to Across the Globe,* is hosted by Rensselaer Polytechnic Institute (RPI) and the New York Institute of Technology (NYIT) and jointly sponsored by SUFS and UTRC. The workshop aims to bring the public and private sectors and researchers together to discuss and share ideas on strategies to improve freight systems. Alison Conway will participate.

3.7.1.5 October 2015, International Urban Freight Conference

The 2015 I-NUF is being organized as part of the midterm site visits for MF and SUFS. Major objectives of this year's conference are to highlight the research being produced by MF, SUFS, and UFP, and to provide a forum to further enhance and extend the VREF CoE network. Eight paper tracks feature CoE research. In addition, the Paris freight survey work will be featured at a luncheon keynote speech, with an interactive data session to follow.

3.7.1.6 SUFS Webinar Series

SUFS conducts the Peer to Peer webinar series to feature new research and best practices aimed at solving urban freight problems. MF disseminates information on all SUFS webinars via the MF website and social media. MF partners have participated in the webinars. Laetitia Dablanc spoke at a July 22, 2014 webinar together with Anne Goodchild, University of Washington, on changing spatial patterns of warehouses in large metropolitan areas. Alison Conway presented on August 19, 2015 with Franklin Jones, B-Line Urban Delivery. The webinar was titled, Cargo Cycles: the North American Experience.

3.7.2 Student enrichment

3.7.2.1 August 2014 PASI-SUFS

SUFS invited MF to join the Pan-American Advanced Studies Institute on Sustainable Urban Freight Systems (PASI-SUFS). The purpose of PASI-SUFS was to promote intellectual exchange between junior and senior urban freight researchers, and hence promote more research in this field. Dablanc, Giuliano and O'Brien participated as senior researchers, and Eleanora Morganti (IFSTTAR) and Sanggyun Kang (METRANS) participated as junior researchers.

3.7.2.2 PhD Workshop and VREF Workshop, Transforming access, mobility and delivery in cities

The October 2014 VREF Workshop in New York City included a one day PhD workshop held the day before the VREF CoE workshop. Three MF PhD students participated in the workshop: Adeline Heitz (IFSTTAR), Adrien Beziat (IFSTTAR), and Shuai (Louis) Tang, (UTRC).

3.7.3 Research exchanges

The following research exchanges took place during the first 2 ½ years of the grant. Except for Dablanc visits to USC, they benefited from VREF Study Visit Grants on behalf of the MetroFreight Center of Excellence (CoE):

2013 *Laetitia Dablanc*, one month at USC in July 2013
2014 *Martin Koning*, two months at City College of NY in spring 2014
2014 *Marco Dean*, PhD student at the Bartlett School of Planning, University College London; visited University of Southern California and presented his research.
2014 *Laetitia Dablanc*, one month at USC in July 2014
2014 *Felipe Aros* (RPI, SUFS CoE), two weeks at IFSTTAR in March 2014 to work with Adrien Beziat
2015 *Laetitia Dablanc*, one month at USC in July 2015
2015 *Takanori Sakai,* PhD student in Urban Planning and Policy at the University of Illinois, Chicago; will work with Dr. Laetitia Dablanc, IFSTTAR, on logistics sprawl.
2015 *Mathieu Gardrat*, PhD student at University of Lyon and a member of the Paris urban freight survey team, will spend one week at METRANS in October 2015.

3.7.4 Research collaborations

November 2015, Laetitia Dablanc will start a three year collaboration with the Urban Freight Platform as a visiting scholar at the University of Gothenburg (Johan Woxenius team) on a part time basis (six weeks a year).

She will give lectures, contribute to the supervision of students, participate in a local project on urban freight involving the city of Gothenburg, and work on a research project with Swedish colleagues on spatial patterns of warehouses in the Gothenburg area.

Felipe Aros (RPI-SUFS) and Adrien Beziat (IFSTTAR-MF) have started collaboration on urban freight data, comparing data from NYC and Paris and looking at modeling techniques that help with carrying out research on urban freight related congestion.

Michael Browne (University of Westminster-SUFS/UFP) and Laetitia Dablanc (IFSTTAR-MF) collaborated in 2014 and first semester of 2015 on the London Low Emission Zone (MF Research 2.2a, RETMIF project). Michael Browne collaborated on the London survey. He provided expertise and key contacts, and participated in several meetings. On June 10, 2015, an event was organized by IFSTTAR and University of Westminster in London for the presentation of this project to London urban freight stakeholders.

3.8 INITIATIVES FOR IMPLEMENTATION AND TRANSFER OF KNOWLEDGE TO, AND INTERACTION WITH OTHERS THAN ACADEMIC PARTNERS; EXPERIENCES AND IMPACTS

MetroFreight engages with industry and government partners in many ways, and MF researchers are directly involved with policy design and implementation through advisement and committee memberships.

3.8.1 Outreach to industry, government, and community

Each of the MF partners conducts outreach efforts to government and industry. Although these activities are typically not funded by MF, they are venues for sharing MF research, and for raising the visibility of urban freight problems and solutions. METRANS sponsors the annual CITT State of the Trade and Transportation Industry Town Hall meeting, a two hour evening event focused on a specific topic and aimed at a general audience. The METRANS Industry Outlook is held twice a year and targets goods movement stakeholders. As part of the Federal Highway Administration Talking Freight series, METRANS organized a webinar to present highlights from the 2013 I-NUF Conference. O'Brien and Rodrigue took part as presenters. The METRANS Advisory Board represents industry and government and provides guidance on the MF program.

IFSTTAR conducts regular meetings to present results of MetroFreight research. These meetings usually take place either at the City of Paris Transport Department or at the FNTR headquarters (the Federation Nationale du Transport Routier), one of the main French organizations of freight transport companies.

UTRC conducts a regular lecture series that is aimed at practitioners. The center organized a workshop on last mile issues on October 5, 2013 (see Section 3.7.1). In June 2014, Rodrigue and Conway participated in the NYMTC Freight Working Group event - Where Will Our New Freight Planners Come From?

KOTI, in its role as a government funded research institute, actively interacts with industry, national and local governments, and other research institutes. MF funded research has been shared at a joint seminar with Inha University on urban logistics challenges in Seoul (June 2014), and a seminar on parcel delivery services (December 2014). Participants included researchers and logistics industry representatives. The close partnership with industry has made possible data collection from carriers on parcel deliveries.

3.8.2 Engagement in policy and planning

The MF leadership is extensively involved in national, state and local planning and policy-making, often having a direct impact on policy choices. Giuliano is a member of the US National Freight Advisory Committee and the California Freight Advisory Committee. Giuliano and O'Brien are members of the California Freight Efficiency Strategy Development Team. All of these efforts have led or are leading to specific legislation proposals. In New York, Robert Paaswell serves on the Board of the NYC Urban Assembly School for Global Commerce; and Paaswell and Conway are working with the Economic Development Commission to plan a Freight focus group in fall 2015. Rodrigue serves on the advisory board of the US Merchant Marine Academy at King's Point.

In Paris, Dablanc is a member of the scientific committee and the steering committee of the Paris Sustainable Logistics Charter. The MF team is a regular participant in working groups of the Sustainable Logistics Charter. KOTI has served as consultant on city logistics consolidation projects for Incheon and Pyeongtaek. KOTI is also providing support for the National Logistics Master Plan, including analysis, development of action plans, and conducting workshops. KOTI works closely with industry; for example, it has developed a plan for improving truck flows at an intermodal logistics park. It also works closely with MOLIT (Ministry of Land, Infrastructure and Transport), participating in forums and meetings.

3.9 NATIONAL AND/OR LOCAL COLLABORATIONS GENERATED BY THE CoE GRANT AND THEIR IMPACT

The MetroFreight partners each have established national and local networks. As noted earlier, each of the partners is an established transportation research center conducting research on a variety of topics. The main impact to date of the CoE has been to strengthen and expand these networks, as a result of the increased research activity in urban freight that the CoE funds.

3.9.1 METRANS

At METRANS, the most significant change is our newest center, the Southwest Transportation Workforce Center (SWTWC), awarded in 2014. METRANS was selected by the USDOT to be the southwest region's transportation workforce development center. The region includes 8 states. The purpose of the center is to engage regional and national stakeholders to identify successful curricula and training programs; develop a Transportation Workforce Data Clearing House for business, education, transportation and labor; analyze labor force and job needs; and identify programs that facilitate transfers between grade 6-12 schools, community colleges, and 4-year institutions. Consortium partners include Texas A&M University; ICF International, aleading labor market analysis firm; and the National Occupational Competency Testing Institute which brings expertise in primary and secondary career and technical education. This center award builds directly on the professional development and training programs developed at CSULB.

A second benefit from the CoE is the hiring of Dr. Geraldine Knatz, Professor of Practice, at USC. Dr. Knatz is the former Executive Officer of the Port of Los Angeles, and holds a PhD in biological sciences. She is internationally recognized as a leader in environmental policy. She is teaching two classes, advising students, and this year begins a MF research project.

3.9.2 IFSTTAR

IFSTTAR has greatly increased its ties with local agencies and practitioners. In addition to the Sustainable Logistics Charter work described in Section 3.8, IFSTTAR has regular interaction with the Paris urban planning agency (APUR) and Ile-de-France planning agency (IAU). IAU hosts Adrien Beziat (MF PhD student) one day a week to participate in modeling work. The existence of MF directly contributed to the establishment of a partnership between IFSTTAR and the Region Ile-de-France and the LET (Laboratory of Transport Economics of Lyon). Beziat was granted direct access to raw data and was associated with the survey data processing.

An important benefit of these efforts is that local agencies and governments have increased their knowledge about urban freight. Some local legislation directly benefitted from MF research, such as the new Paris Low Emission Zone (started July 1, 2015) prohibiting oldest trucks. Good networking with industry has also facilitated access to company data (such as on e-commerce deliveries or on electric commercial vehicles).

3.9.3 UTRC and KOTI

National or local collaborations for UTRC and KOTI are described in Section 3.8.

3.10 ADDITIONAL (MATCHING) FUNDING GENERATED BY THE CoE GRANT

Table 3.10a reports match funding for March 1, 2013 to June 30, 2015, close of USC fiscal year. USC policy requires match funding per the approved grant budget reported. Additional funds are reported in Section 3.11. Budget and all subcontracts are in US dollars. Due to exchange rate fluctuations, dollar amounts do not necessarily reflect SEK values. The last approximates SEK per average exchange rates. The columns are total committed cost share for years 1 – 3, then amount expended, and remaining balance. We are ahead of target in cost share, and will exceed grant commitment, as a result of greater than anticipated investment in MF on the part of the partners. Table 3.10b explains row items.

Table 3.10a: Additional Match Funding, March 1, 2013 to June 30, 2015

Row	Cost Categories	Budget, Yrs 1-3	Cost Share	Balance
Salaries- Faculty, Staff & Students (incl. Fringe)				
1	USC Price + VSOE	$ 77,457	$136,386	$ (58,929)
2	Subcontract CCNY	$ 17,940	$ 27,900	$ (9,960)
3	Subcontract CSULB	$ 42,776	$ 24,352	$ 18,424
4	Subcontract IFSTTAR	$ 210,000	$ 74,401	$ 135,599
5	Subcontract KOTI	$ 123,800	$ 93,760	$ 30,040
Materials (incl. subcontracting, translations and data)				
6	USC Price + VSOE			
7	Subcontract CCNY			
8	Subcontract CSULB	$ 15,000	$ 5,000	$ 10,000
9	Subcontract IFSTTAR			
10	Subcontract KOTI	$ 1,500	$ 11,200	$ (9,700)
Travel				
11	USC Price + VSOE			
12	Subcontract CCNY			
13	Subcontract CSULB			
14	Subcontract IFSTTAR			
15	Subcontract KOTI	$ 2,100	$ 5,500	$ (3,400)
Courses, Seminars, Etc.				
16	USC Price + VSOE		$ 15,990	$ (15,990)
17	Subcontract CCNY		$ 2,000	$ (2,000)
18	Subcontract CSULB			
19	Subcontract IFSTTAR			
20	Subcontract KOTI	$ 1,800	$ 5,000	$ (3,200)
GRA Tuition and Medical, Fellowships				
21	USC Price + VSOE	$ 136,665	$ 21,312	$ 115,353
22	Subcontract CCNY		$ 41,575	$ (41,575)
23	Subcontract CSULB			
24	Subcontract IFSTTAR			
25	Subcontract KOTI			
Facilities and Administration				
26	USC Price + VSOE	$ 103,108	$ 95,783	$ 7,325
27	Subcontract CCNY	$ 9,508		$ 9,508
28	Subcontract CSULB	$ 12,422	$ 7,632	$ 4,790
29	Subcontract IFSTTAR			
30	Subcontract KOTI			
TOTAL		**$ 754,077**	**$567,791**	**$ 186,286**
SEK (Ave. exchange rate 2013-2015 = 7.0862)		5,343,538	4,023,481	1,320,057

Table 3.10b: Notes on Cost Share, March 1, 2013 - June 30, 2015

Row	Explanation
1	Cost share of Center Director salary and 25% effort program administrator, 25%/50% effort research assistants, and Prof. Geraldine Knatz.
2	P.I. In kind contributions - King, Wang, Rodrigue, Conway
3	Share of Associate Director salary years 1 and 2; Tyler Reeb for articles for various social media outlets and Jubin Sukhadia for social media and website work involving VREF
4	Cost share to compensate team lead, cartographer, statistician, 7 research assistants: Laetitia Dablanc fully paid through Grad student support funds, not VREF. Others with no VREF funding were 10 days of Emilie Gaubert, project engineer; 15 days of Martin Koning; 8 days of Eleanora Morganti; 4 days of Petronille Reme-Harnay. In Year 2, cost share consisted of 120 days Laetitia Dablanc fully paid through grad student support not VREF; 14 days of Francoise Bahoken, project engineer; 25 days of Emilie Gaubert; 40 days of Martin Koning; 230 days of Antoine Montenon; 50 days of Eleonora Morganti; 20 days of Petronille Reme-Harnay; 20 days of Pierre Launay.
5	Cost share compensation of 2 other researchers from government endowment to KOTI for faculty salaries and expenses; KOTI Research Fund of an estimated $22,000 to support research assistant; KOTI project fund to support travel and MOLIT fund for research assistant salaries
6	
7	
8	NETS Data
9	
10	MOLIT fund (est. $90,000) for the urban and regional logistics consolidation consulting project supplies
11	
12	
13	
14	
15	Supplement travel funds
16	
17	UTRC funded project entitled "Freight Costs at the Curbside: Impacts of Accessibility Restrictions"
18	
19	
20	
21	75% USC VSOE share of tuition for students
22	Student in kind contributions of Yue Dou and George Todorovic; 2014-2015 FHWA Eisenhower Fellowships (Percy Casani and Xue Bing Yeap); 2015-2016 FHWA Eisenhower Fellowships (Lisa Chauvet and Medwin Chiu); LSAMP Fellowship (Lisa Chauvet); STEP Fellowship (Medwin Chiu); Nathan Tavernier (Intern supported by ENTPE/French Ministry of Ecology, Sustainable Development and Energy, 5 months) Victor Leal-Tavares (Intern supported by Brazilian Scientific Mobility Program, 9 weeks)
23	
24	
25	
26	F & A at Federally negotiated rate on cost share salary account and 15% on METRANS Associates Program account; difference between federally negotiated rate and the METRANS lower 50% rate in indirect costs on master and satellite accounts.
27	CCNY F&A 54%
28	CSULB F&A 26%
29	IFSTTAR F&A 8%
30	KOTI F&A 9%

3.11 FUNDING FROM OTHER SOURCES, NOT GENERATED BY THE CoE FUND, BUT STILL IMPORTANT FOR THE CoE ACTIVITY

As described in earlier sections, MF is a partnership of four research centers or institutes, each having a large portfolio of transportation research, education, and outreach. In this section we briefly describe the main funding sources and activities that support the CoE but are not formally counted or reported as match funding to the VREF grant.

3.11.1 METRANS

Receipt of the CoE increased our visibility and competitiveness for additional grants. METRANS is a partner in the National Center for Sustainable Transportation (NCST) which is led by University of California, Davis, and includes University of California, Riverside, Georgia Tech, and University of Vermont, in addition to METRANS. METRANS' focus is sustainable freight transport. The grant is approximately $500,000 per year, with a required 100% match. About half of the match is provided by Caltrans, and the remainder is from donor funds, other research, and selected MF projects. Approximately $450,000 in urban freight research is being funded through NCST. See http://www.metrans.org/research-projects/national-center-for-sustainable-transportation for a list of projects.

The METRANS Tier 1 UTC is also funding urban freight research. The Tier 1 UTC is a partnership of USC and CSULB, and its theme is increasing the economic competitiveness of large metropolitan areas through improved transportation system performance. From 2012 the UTC has funded 13 urban freight projects, with total funding of approximately $1.2 million. See http://www.metrans.org/research-projects/metrans-utc. NCST and Tier 1 support education, professional training, and communications that enhance MF. Finally METRANS continues to develop its donor base through the METRANS Associates Program. These funds are used as match for center grants, to support the I-NUF conference, and to support the core administration of the center.

3.11.2 UTRC

UTRC is a Regional University Transportation Center, and it provides support through its UTC funding. Two urban freight research projects have been funded at a total of about $217,000, through a combination of UTC funds and match from NYCDOT and CCNY, and a joint workshop on last mile freight was funded by approximately $63,000 in UTC funds.

3.11.3 IFSTTAR

IFSTTAR has received additional funding from several sources. The French Agency for Energy and the Environment (ADEME) has co-financed research on Low Emission Zones and urban freight. The PUCA (Plan Urbanism Construction Architecture – Planning, Construction and Architecture Plan), a national research fund, contributed to research on e-commerce. Renault car manufacturing company is contributing to a PhD, financing research on electric delivery vehicles in Paris.

3.11.4 KOTI

All KOTI cost share is listed in Section 3.10; there are no additional funding sources for MF work.

3.12 OTHER POSITIVE EFFECTS OF THE CoE GRANT

In addition to the positive impacts we have described in previous sections, there are some more general effects that are important to identify. First, we observe a growing interest and awareness of urban freight within the urban planning community, particularly in North America. Although transportation has been a fundamental part of urban planning since its establishment as a field of study many decades ago, transportation planning research has focused almost exclusively on passenger transport. Urban

transport problems were viewed as passenger problems (e.g. mobility, accessibility, safety). If addressed at all, freight was an externality to be controlled, if not eliminated.

Largely as a result of the work of MF and SUFS partners, the planning community is beginning to show an interest in urban freight, both in research and practice. US cities are beginning to plan for freight, and to more effectively manage freight activities. Cities in Europe are benefitting from a much improved understanding of how freight moves in cities, and what policies are most effective for managing freight problems. Although this might have happened without the VREF CoEs, it certainly would not have developed as rapidly or as broadly.

Second, VREF support has contributed to the strengthening of the international network of scholars across disciplines. In urban freight, this is particularly the case for: 1) spatial analysis of warehouses; 2) Low emission zones and trucks; 3) urban freight data collection/modeling. Not only does urban freight research and practice benefit; these networks are then in place to address different research areas and topics, contributing more generally to scholarship and knowledge generation.

Third, the CoE grants increase the overall level of research activity, attracting more and better students and generating the critical mass necessary for expanded graduate course offerings, field and professional experiences, etc. This in turn generates better trained students who enjoy more extensive career pathway opportunities. The long-term outcome is a next generation workforce with the tools to implement the leading edge knowledge they receive in the classroom.

Fourth, a large and sustained university research activity leads to new faculty and research staff positions. At METRANS, new hires from 2012 include John Gunnar Carlsson (USC, ISE), Geraldine Knatz (USC, PP/CEE), Yan Li (CSULB, MAE), and Tyler Reeb (CSULB, CITT). At IFSTTAR, a temporary position on urban freight was transformed in fall 2014 into a tenured position (held by Gwenaelle Raton, a new member of the Paris MF team).

Finally, by expanding our freight related research and educational offerings, we provide more extensive career pathway opportunities for our students.

3.13 PLANS FOR THE REMAINING TIME OF THE CoE AND ANY DEVIATIONS FROM THE ORIGINAL PLAN

We are carrying out our program of activities largely as described in our proposal.

3.13.1 Planned research and educational activities

We have carried out the research plan as described in our proposal, and do not plan any major changes. Adjustments in specific projects and researchers continue to be made in response to changes in availability, new faculty and staff hires, (growing) opportunities for match funding, and other factors.

3.13.1.1 Research plan

Section 3.3 discussed research progress to date. We are currently in the middle of Year 3, given the effective start of the grant in June 2013. Due to space limitations, this section briefly describes our planned research activities for the final years of the grant. We have 11 projects that will be completed in Year 3, and 3 multiyear projects that will continue through the end of the grant (Ioannou, 1.2a Modeling for local impact analysis, Beziat, 2.3a Paris freight survey, and Dessouky, 3.1a, Integrating truck and train systems). Descriptions and abstracts of all continuing projects are available on the MF website. The remainder of this section describes new projects planned for Years 4 and 5. This is not a complete list; we are continuing to evaluate our efforts across the research themes.

Theme 1 Role of policy from industry perspective

Year 4 and 5 research for thematic area 1.1 will continue to explore the interface of policy and industry. The KOTI research on parcel freight deliveries will continue, extending to other metro areas and the nation. The Paris research, much of it using the Paris freight survey data, will address congestion from urban freight at the level of the city of Paris. Available data will also be used by Dablanc for the CITYLAB project (*Observatory of Strategic Developments Impacting Urban Logistics*). Research on sub-contracting in the Paris urban freight industry will continue. With regard to topic 1.2, Models for local area impact analysis, the microscopic port and traffic models will be integrated; the traffic models will be calibrated with real data; and the model will be tested by analyzing the relationship of WDC patterns and truck volumes, VMT, and delay.

New Projects: Knatz (1.1f, Evolving models of port cooperation on the West Coast) will explore the forces that are motivating competing ports on the US west coast to cooperate and identify how those models of cooperation are evolving due to market pressures. Giuliano and Yuan (1.1g, Impact of freight corridors on residential land values) will examine the impacts of high volume freight corridors on local neighborhoods.

Theme 2 Last mile strategies

Although theme 2.1, Central city logistics strategies, was scheduled to end by Year 4, central cities are the focus of efforts to manage urban freight, and there are many questions yet to be addressed. We plan to continue research on central city logistics strategies. In addition to continuing the logistics strategies work in Paris and Seoul, we are seeking additional funding resources to support research on urban design strategies to better accommodate freight demand.

New Projects: O'Brien and Steimetz (2.1.e, Evaluation of drayage load match services) will examine the Los Angeles experience with load matching services as a response to congestion challenges at the ports and in the metropolitan region. Dablanc (2.2.d, Electric vehicles for last mile deliveries) will extend research on commercial electric vehicles, and will also take part in assessment studies of the new Paris Low Emission Zone (Dablanc, 2.2e, Evaluation of the Paris LEZ). After some delays in cleaning and processing the Paris freight survey data, IFSTTAR will focus on doing as much research as possible during the remaining years of the grant. In addition to congestion, topics to be explored include urban freight modeling (updating the FRETURB model).

Theme 3 Improving passenger-freight interactions

Research on Theme 3.1, Integrating truck and train systems in LA, continues through the period of the grant. Next steps in this research include expanding the developed local optimization techniques to system wide control to further improve the efficiency of the rail operations in regions similar to LA.

New projects: Ioannou, Dessouky and Giuliano (3.2.e, New models for integrated management of goods movement) will examine the potential for "load balancing" by managing rail and truck as an integrated system.

Theme 4 Land use dynamics

Research in Theme 4 will increase in the remaining years of the grant. We have added a new subtopic, spatial analysis and modeling that will include our continuing work on the freight landscape). Dablanc will extend comparison of WDC location patterns in US and Europe metro areas with Tokyo. The Urban Freight Atlas work will also continue (Rodrigue, 4.1.f, continuing); its purpose is to explore similarities and differences in spatial structure across our case study cities.

New Projects: Dablanc (4.1.g, Feasibility of in-city logistics terminals) will analyze two Paris urban logistics hotels, as a joint project with CITYLAB, starting with legal and technical issues associated with

building freight terminals in urban areas. Giuliano and Kang (4.1.h, Analysis of WDC trends in the US) will extend the California research on WDC location to 100 US metro areas to test hypotheses regarding shifts in location, and to conduct simulations to estimate truck VMT impacts. Giuliano and Hutson (4.1.i) will examine relationships between warehouse location, rents, and drayage costs. Giuliano (4.2.a, Developing and testing the freight landscape), will develop additional tests of the basic theory as described in Section 3.3.1.2.

Theme 5 Changing production and consumption

Theme 5 research will include the continuation of home-based deliveries in New York City, Paris, and Korea. The New York team will use a mixed methods approach to develop a more complete picture of the steps in the local and regional supply chain management process of goods delivery to residential buildings in New York City (5.1a, continuing). The KOTI team will focus on the dynamics of home-based consumption and its freight movement in cities (SEO, 5.1.b, continuing). They will explore recent changes in consumption behavior and how logistics companies adjust their freight transportation strategies to meet the needs generated by these new consumption patterns. The IFSTTAR team is participating in an e-commerce survey that will be the basis for subsequent analysis of e-commerce delivery patterns.

3.13.1.2 Planned education activities

As noted in Section 3.4, we will continue to develop the graduate course on urban freight. We will offer it again at CCNY in the 2015-16 academic year and in following years at CCNY and USC, conditional upon sufficient demand. After refining the course, we will make it available to other universities. The course is structured into distinct models, which will allow other programs to select portions as appropriate for particular disciplines or degree programs. The curriculum database will be maintained and updated through the life of the grant, providing a publicly available resource for educators around the world.

Professional training will continue through the life of the grant, and the current short courses will be extended to New York and Korea. Experiences with the test courses will help us refine the product. With the expansion of professional development products taking place at CSULB through CITT, and the presence of the SWTW workforce development center, MF professional development will increase. New products include: 1) train the trainer courses to introduce freight topics at the high school level; 2) short courses on urban freight for public agencies and for international trade professionals. With some adaptation, these courses can be offered around the world. Professional training will also continue through the individual efforts of MF faculty.

3.13.2 Dissemination and facilitating implementation

Dissemination to the academic community takes place through conference presentations and refereed publications. Dissemination to the professional community takes place through conferences, workshops, participation in policy and planning groups, and professional consulting. MF seeks to bring together the academic and professional communities; hence we discuss both in this section.

WCTR and Seoul 2016: After WCTR 2016 in Shanghai, we plan a MF team meeting and site visit in Seoul, Korea. KOTI is planning a joint seminar with the Korea Logistics Society during this MF team visit to Korea, and is discussing the possibility of a special session to highlight MF research. KOTI also plans to contact its industry partners for the site visit to Euiwang ICD and Seoul Integrated Freight Terminal during their stay.

ICCL 2017: MF researchers will participate in the 2017 ICCl conference to continue disseminating MF research results to the academic community.

I-NUF 2017: I-NUF is held biennially. After the 2015 conference, METRANS and MF will hold the next I-

NUF conference in 2017. We anticipate that I-NUF will continue to grow and become an increasingly important global forum for urban freight research.

Multimedia communications: We will continue to expand our website, media communications, newsletters, videos and other dissemination venues. The Research Brief series has been launched, and the next step is to work with VREF to adapt these briefs to the VREF format for dissemination through the VREF network.

Facilitating implementation: It is difficult to predict in advance what research may be implemented, and when implementation may take place. That said, the government and industry partnerships that we have established are already bearing results. Examples include:

- KOTI: assistance to the Korea National Logistics Master Plan, management plan for the Euiwang logistic park, information sharing with industry;
- IFSTTAR: contribution to developing the Paris LEZ; participation in Sustainable Logistics Charter working groups;
- METRANS: Development of recommendations for increasing freight efficiency in California.

Facilitation of implementation takes place mainly through establishing strong relationships with industry and government agencies, and in conducting research that has practical and relatively near-term applications. Section 3.8 summarizes the many activities of MF that are oriented to engagement and implementation. These will continue and likely increase through the life of the grant.

3.13.3 Synthesizing research results

By the time the MF comes to a close, about 40 separate projects will have been conducted. It is therefore appropriate to consider how all this research gets synthesized and communicated to demonstrate the scholarly impact of this effort.

As noted in Section 3.3, we structured MF research to produce a coherent program. The research is organized around specific themes, and similar projects are taking place in different metro areas. This leads to a two dimension synthesis, across themes and across places. In addition, the research each year follows on what came before. In some cases the research is one long-term project (for example the model development projects), in others it is a series (for example the KOTI parcel delivery projects).

We anticipate the following synthesis products:

- Book or monograph on freight landscape typologies, theory, empirics;
- City logistics/urban freight textbook;
- Summary publications in selected thematic areas, as synthesis papers in journals, or short monographs.

3.13.4 Expected outcomes and achievements

In addition to the synthesis products above, the main expected outcomes and achievements are as follows:

Research outcomes: An integrated, multimodal, microscopic/macroscopic simulation model for urban freight policy analysis; MF research documented in refereed journals across several disciplines (urban planning, geography, economics, systems engineering, civil engineering, logistics); Urban Freight Atlas database and website.
Education outcomes: Urban freight course curriculum; Short courses for professional development and training.
Impacts: Better integration of urban freight into city and regional planning practice; recognition of urban

freight as a field of study outside of logistics and systems engineering programs; students better trained in urban freight.

3.13.5 Deviations from original plan

There have been few deviations from the original plan. Lags in contracting and subcontracting put our effective start date at approximately June 2013, hence our work program is about 6 months behind the official accounting of VREF in calendar years. The completion of some projects has been delayed, but most are on schedule. Access to the Paris freight survey was delayed about one year, due to delays in cleaning and processing the data. We have made some deviations from the original work plan to take advantage of unanticipated opportunities. Examples include the Paris work on LEZs and electric delivery vehicles, and the MetroFreight work on port cooperation due to the hiring of Geraldine Knatz.

Although the MF leadership was aware that managing an international consortium across multiple continents would be a challenge, the consortium operation has been smooth and effective. One unanticipated aspect of an international consortium that turned out to be very important was the need for face-to-face interaction. The early in-person meetings of the group were invaluable in learning about one another, developing good working relationships, and generally developing the "social infrastructure" that allows collaborative work via email and conference calls to function.

In addition we did not adequately anticipate the importance of on the ground observation in our respective metropolitan areas. In Year 1 we decided that we should engage in site visits with all the partners. The first Los Angeles visit took place at I-NUF 2013; a New York team and site visit took place in conjunction with the VREF CoE conference in 2014, another Los Angeles visit will take place at I-NUF 2015, and we will visit Seoul in 2016. The need for in-person meetings has greatly increased the travel portion of the budget.

3.14 FUNDING AND CONTINUED ACTIVITIES OF THE CoE AFTER TERMINATION OF THE VREF GRANT

The CoE grant is part of a larger portfolio of research, education and outreach among the partners. We anticipate continuing much of the MF agenda through new grants and fundraising.

3.14.1 Securing funding for the CoE

As noted earlier, the MF partners are strong and stable research centers that receive other sources of funding. The partners will continue to seek out funding opportunities, and the research network that has developed as a result of the CoE grant improves the competitiveness of the partners for major grants. A recent example is the Horizon 2020 CITYLAB grant. METRANS has a donor development program that is aimed at securing core funding for the center, so that the combination of research and education grants with internal funding may continue much of the MF agenda. The US partners have received funding from all of the main sources for research funding, and we expect our success to continue. In Europe, one main source is the EU frameworks research programs. National bodies such as the French Agency for the Environment provide increased support to urban freight activities. In Paris, thanks to the growing visibility of IFSTTAR expertise in urban freight, industry is beginning to provide financial support.

3.14.2 Continued activities

The VREF investment in urban freight research and education has greatly contributed to the development of an urban freight research community and the recognition of urban freight as an important field of study. Urban freight research by MF, SUFS, UFP and others will certainly continue to increase, as will funding opportunities to support it, particularly in urban planning and transport

engineering. The amount of non-CoE funding for urban freight research (Section 3.11) within MF is illustrative. The relationships and partnerships with government and industry will continue, leading in the longer term to better, more effective management of freight in cities.

The urban freight graduate course will continue as long as there is sufficient student interest. Sharing the curriculum should lead to similar courses being taught in other graduate programs. Professional training will also continue, and short course materials will be made publicly available.

I-NUF will continue to serve as the core of the international urban freight community. As noted earlier, I-NUF is supported by a combination of funding sources, and is not dependent upon CoE funding. As I-NUF draws more participation and ancillary activities, we will seek more funding to maintain the "MF" presence in publications, communications, media, and outreach activities. Our goal is to establish a formal urban freight (or city logistics) center within METRANS that will serve as the permanent home of the activities launched under the CoE grant.

Data collection efforts are another example of a potential area for continued comparative development. E-commerce impact on urban freight is one of the obvious areas where sharing knowledge between MF partners and MF cities in the future will be important.

Finally we plan to continue the Freight Landscape work and promote collection of similar data for other metro areas. We plan to share our work via the web, and encourage others to contribute theory, analysis, and description to achieve a better understanding of the spatial relationships of freight activity and urban form.

3.15 FINANCIAL REPORT

Table 3.15a presents our financial report over the period of March 1, 2013 to June 30, 2015, the close of USC's most recent fiscal year. We provide the same cost categories as in the annual reports. The budget column is the cumulative budget for years 1 through 3. Note that our budget is in US dollars, and all of the subcontracts are issued in US dollars. Because of the fluctuations in the currency exchange rate, the dollar values do not necessarily reflect the SEK budgeted or paid by VREF. The last row of the table gives an approximation based on the average exchange rate over the period. Uses reflect only those for which USC has billed, not expenses incurred, due to the lags in billing across the partners, as evidenced by the relatively greater share of expenses relative to budget for USC. Overall we are on target in expenses relative to work accomplished. The year 3 budgets had to be adjusted downward due to the decline in the value of SEK relative to dollar; VREF has subsequently provided supplemental funding not reflected in this report. Table 3.15b lists the explanations for the row items.

Table 3.15a: VREF Financial Report, March 1, 2013 to June 30, 2015

		Budgets	Uses				Balance
Row	**Cost Categories**	**Years 1, 2, 3**	**Center Admin**	**Research**	**Outreach/ Education**	**Total**	**VREF**
Salaries - Faculty, Staff, Students, Fringe							
1	USC Price + VSOE	$365,783	$124,799	$141,699		$266,498	$99,285
2	Subcontract CCNY	$137,456		$27,187		$27,187	$110,269
3	Subcontract CSULB	$165,240			$70,966	$70,966	$94,274
4	Subcontract IFSTTAR	$204,944		$100,603		$100,603	$104,341
5	Subcontract KOTI	$151,600		$84,800		$84,800	$66,800
Materials (incl. subcontracting)							
6	USC Price + VSOE	$7,170	$4,226	$2,436		$6,662	$508
7	Subcontract CCNY	$6,988					$6,988
8	Subcontract CSULB						
9	Subcontract IFSTTAR	$16,866		$8,500		$8,500	$8,366
10	Subcontract KOTI	$2,300		$1,100		$1,100	$1,200
Travel							
11	USC Price + VSOE	$25,000	$10,827			$10,827	$14,173
12	Subcontract CCNY	$27,835		$15,735		$15,735	$12,100
13	Subcontract CSULB	$17,000			$6,156	$6,156	$10,844
14	Subcontract IFSTTAR	$32,842		$8,000		$8,000	$24,842
15	Subcontract KOTI	$34,500		$20,400		$20,400	$14,100
Courses, Seminars, Etc.							
16	USC Price + VSOE	$2,366		$2,365		$2,365	$1
17	Subcontract CCNY	$5,000					$5,000
18	Subcontract CSULB	$5,887			$4,095	$4,095	$1,792
19	Subcontr. IFSTTAR	$15,060		$11,000		$11,000	$4,060
20	Subcontract KOTI	$10,900		$2,000		$2,000	$8,900
Tuition, GRA Medical, Fellowships							
21	USC Price + VSOE	$56,701		$12,968		$12,968	$43,733
22	Subcontract CCNY	$20,000		$19,712		$19,712	$288
23	Subcontract CSULB						
24	Subcontr. IFSTTAR						
25	Subcontract KOTI						
Facilities and Administration							
26	USC Price + VSOE	$254,301	$119,926	$76,182		$196,108	$58,193
27	Subcontract CCNY	$102,401		$19,227		$19,227	$83,174
28	Subcontract CSULB	$47,872			$21,116	$21,116	$26,756
29	Subcontr. IFSTTAR	$21,738		$10,247		$10,247	$11,491
30	Subcontract KOTI	$18,200		$9,200		$9,200	$9,000
	Undedicated Funds	$92,500					$92,500
TOTAL		**$1,848,450**	**$259,777**	**$573,361**	**$102,333**	**$935,471**	**$912,979**
SEK*		**$13,098,486**	**$1,840,835**	**$4,062,950**	**$725,153**	**$6,628,938**	**$6,469,548**

*Average exchange rate 2013-2015 = 7.0862

Table 3.15b: Notes on Use of Funds, March 1, 2013 to June 30, 2015

Row	Explanation
1	Compensation for research faculty, project manager and GRAs
2	Compensation for research faculty and GRAs
3	Compensation for team lead, administrator, research assistant
4	Compensation for A. Beziat & A. Heitz
5	Compensation for team lead Dr. Seo, researcher Jee-Sun Lee and a year for Changjin Ahn.
6	Project and seminar supplies
7	
8	Project supplies, training materials
9	Books, supplies, room booking for MetroFreight Day
10	Project and seminar supplies
11	TRA 2014, Center Director travel to NY in Oct.
12	TRB 2014, TRA 2014
13	TRB 2014, TRA 2014
14	TRB 2014, TRA 2014, IFSTTAR/SPLOTT; DEVPORT; Dablanc to New York, L.A. and Delft; Beziat to Lyon
15	TRB 2014, TRA 2014; On site survey within Korea
16	Seminar expenses
17	
18	Project supplies, training materials
19	Translations Dablanc, Gaubert, Bahoken, Guerrero; Interface Contract
20	Expenditures for Outreach such as joint seminars and meetings
21	25% VSOE tuition for students, 2015-June 2015
22	CCNY share of GRA tuition
23	
24	
25	
26	USC F&A 50%
27	CCNY F&A 54%
28	CSULB F&A 26%
29	IFSTTAR F&A 8%
30	KOTI F&A 9%

3.16 COMMENTS ON THE INTERACTIONS WITH VREF

It is our pleasure to work with VREF. Having managed many large grants from many different funding agencies, the PI finds VREF to be the best we have experienced. The interaction with VREF works very well for the following reasons:

- VREF demonstrates a genuine interest in the work we are doing and recognition of its societal importance.
- VREF is clearly dedicated to its mission (new knowledge, education, outreach, implementation for sustainable and equitable transport), making its objectives for the CoE clear and unambiguous.
- VREF has invested great effort in developing and supporting the urban freight research network by organizing conferences, providing travel grants, publishing the urban freight monograph, and conducting an extensive communications program.

- There is a good balance of oversight and independence of the research team.
- VREF CoE management is efficient, responsive, timely, and transparent.
- The administrative burden of the grant is reasonable.
- There is enough flexibility in the grant management to respond to problems and generate solutions in an efficient manner.
- We appreciate the patience and understanding of VREF in processing multiple contracts and subcontracts across multiple currencies.

3.17 COMMENTS ON THE CoE CONCEPT

This response reflects the PI's experience with centers of excellence in the US funded by the National Science Foundation, the National Institutes of Health, mission agencies (US DOT, Homeland Security, Agriculture, Energy), and foundations. The NSF follows a similar model to that of VREF; research centers of excellence on specific topics are funded for 3 to 5 years. The NSF IGERT (Interdisciplinary Graduate Education, Research and Training) program works the same way. The history of these centers indicates that most centers do not survive for very long after the funding is ended. Faculty may continue to obtain funding to conduct the research through individual grants and other resources, and graduate students may continue to be attracted to the field, but the center is either absorbed into another entity or is closed down. The explanation is lack of core funding once the grant ends.

NIH and the mission agencies follow a different model. Centers are funded in specific fields (e.g. aging population, diabetes) for 3-5 year grants which are competitive and subject to renewal. Center programs change over time, in response to changing research agendas. The USDOT University Transportation Centers program funds 36 UTCs, which are competed periodically. This model acknowledges the need for ongoing core funding if research centers are to maintain operations over a period of time.

An appropriate question to ask is why centers of excellence should be funded in the first place. Research funding will attract faculty, whether it is provided in the form of a center or as individual grants. The justification for a center is in creating a critical mass that moves the state of knowledge forward more rapidly, in generating resources to develop supporting education programs and specialized training for PhD students, and in developing the outreach and communications programs to foster the transition of research to practice. Core funding is needed to achieve these objectives, and such funding is not available from traditional (individual) research grants.

If the VREF CoE goal is to seed an area of research, and then leave it to the researchers to further develop appropriate funding streams, the current model works well. If the VREF CoE goal is sustained effort in a specific area, VREF should consider a renewal process, at least until the research program is firmly established (e.g. critical mass of faculty, students, graduate programs, etc.). Other possibilities include: 1) continued support of specific, particularly worthy research, education or outreach programs; 2) a competitive individual grant program in the VREF targeted areas; 3) smaller core funding grants to support individual grant-based research programs; 4) bridge funding grants to provide support between major grants.

3.18 REFERENCE LIST AND THESES

Our list of scientific production is drawn from research conducted from the four MetroFreight partners during the first 2 ½ years of the grant. This section has three parts: publications, PhD graduates, and MF papers to be presented at I-NUF 2015. We include the list of papers for the site visitors who will attend the conference.

3.18.1 Publications

Refereed Publications

Acciaro, M., Vanelslander, T., Sys, C., Ferrari, C., Roumboutsos, A., Giuliano, G., and Kapros, S. (2014), Environmental sustainability in seaports: a framework for successful innovation. *Maritime Policy & Management*, 41(5), 480-500.

Abadi, A. and Ioannou, P. (2014), Optimization strategies for resilient freight transport and sustainability, *IEEE 53rd Annual Conference on Decision and Control (CDC)*, IEEE, 6472-6477.

Abadi, A., Rajabioun, T., and Ioannou, P. A. (2015), Traffic flow prediction for road transportation networks with limited traffic data, *IEEE Transactions on Intelligent Transportation Systems*, 16(2), 653-662.

Conway, A, Cheng J., Peters, D., and Lownes, N. (2013), Characteristics of multimodal conflicts in urban on-street bicycle lanes, *Transportation Research Record*, 2308, 93-101.

Dablanc, L., Giuliano, G., Holliday, K., and O'Brien, T. (2013), Best practices in urban freight management: Lessons from an international survey, *Transportation Research Record,* 2379, 29-38.

Dablanc, L., Ogilvie, S., and Goodchild, A. (2014), Logistics sprawl: differential warehousing development patterns in Los Angeles, California, and Seattle, Washington. *Transportation Research Record: Journal of the Transportation Research Board*, 2410, 105-112.

Dablanc, L. (2014), "Etalement logistique" à Atlanta et Los Angeles. *Transports*, vol. 483, 5-19.

Dablanc, L. (2014), Logistics sprawl and urban freight planning issues in a major gateway city - the Case of Los Angeles, In *Sustainable Urban Logistics: Concepts, Methods and Information Systems*, 49-69.

Dablanc, L. and Montenon, A. (2015), Impacts of environmental access restrictions on freight delivery activities: The example of Low Emission Zones in Europe. In *Transportation Research Board 94th Annual Meeting* (No. 15-2827).

Giuliano, G. and A. Linder (2014), "Impacts of the Clean Air Action Plan on the port trade industry," *International Journal of Shipping and Transport Logistics*, 6(2), 172 – 188.

Giuliano, G. and A. Linder (2013), "Motivations for voluntary regulation: The Clean Air Action Plan," *Energy Policy*, 59, 513-522.

Guerrero, D. and Rodrigue, J. P. (2014), The waves of containerization: shifts in global maritime transportation. *Journal of Transport Geography*, *34*, 151-164.

Hall, P.V., O'Brien, T. and Woudsma, C. (2013), Environmental innovation and the role of stakeholder collaboration in west coast port gateways, *Research in Transportation Economics*, 42, 87-96.

Heitz, A. and Dablanc, L. (2015) Logistics spatial patterns in Paris: the rise of the Paris basin as a logistics megaregion. Transportation Research Record: Journal of the Transportation Research Board, 2477, pp. 76-84.

Morganti, E., Dablanc, L., and Fortin, F. (2014), Final deliveries for online shopping: The deployment of

pickup point networks in urban and suburban areas. *Research in Transportation Business & Management*, *11*, 23-31.

Morganti, E. and Dablanc, L. (2014), Recent innovation in last mile deliveries. In Hyard, A., *Non-technological Innovations for Sustainable Transport: Four Transport Case Studies,* Springer International Publishing, 27-45.

Mu, S. and Dessouky, M. (2013), Efficient dispatching rules on double tracks with Heterogeneous train traffic," *Transportation Research, Part B: Methodological*, 51, 45-64.

Ng, A. K., Ducruet, C., Jacobs, W., Monios, J., Notteboom, T., Rodrigue, J. P., and Wilmsmeier, G. (2014), Port geography at the crossroads with human geography: between flows and spaces. *Journal of Transport Geography*, *41*, 84-96.

Nguyen, C., Toriello, A., Dessouky, M., and Moore, J. (2013), Evaluation of transportation practices in the California cut flower industry, *Interfaces*, 43, 182-193.

Reme-Harnay, P., Cruz, C., Dablanc, L. (2014) La sous-traitance de la messagerie urbaine: logiques économiques et rapports de dépendance? Economies et Sociétés, 36(9), pp. 1473-1512.

Rodrigue, J-P. and Notteboom, T. (2014), Looking inside the box: evidence from the containerization of commodities and the cold chain, *Maritime Policy and Management*, in press.

Zhao, Y. and Ioannou, P. (2015), Positive train control with dynamic headway based on Active Communication System, *IEEE Transactions on Intelligent Transportation Systems*, forthcoming.

Books, book chapters, other publications

Dablanc, L. and Rodrigue, J-P. (2015), “Urban freight distribution: a global typology”, in G. Giuliano and S. Hanson (Eds.) *The Geography of Urban Transportation*, 4th Ed., New York: The Guilford Press, in press.

Dablanc, L. and Rodrigue, J-P. (2014), City logistics: towards a global typology. In *Transport Research Arena (TRA) 5th Conference: Transport Solutions from Research to Deployment*.

Dablanc, L. and Frémont, A. (Dir.) (2015), *La métropole logistique*. Paris, Armand Colin.

Giuliano, G. and L. Dablanc (2013) “Approaches to managing freight in metropolitan areas,” Conference Proceedings 50, City Logistics Research: A Trans-Atlantic Perspective, Commissioned paper, Available at http://onlinepubs.trb.org/onlinepubs/conf/cp50.pdf.

Giuliano, G., T. O’Brien, L. Dablanc, K. Holliday (2013), *Synthesis of Freight Research in Urban Transportation Planning*, NCFRP Report 23. Washington D.C.: National Cooperative Freight Research Program (refereed)

Giuliano, G. and S. Hanson (Eds.) (2015), *The Geography of Urban Transportation*, fourth edition, New York: Guilford Press, in press.

Giuliano, G., S. Chakrabarti, and M. Rhoads (2014), Transport geography, *International Encyclopedia of Social and Behavioral Sciences, 2nd edition,* Oxford, UK: Elsevier Science, Ltd.

Kamga, C., Miller, B. and Spertus, J. (2013), Eliminating trucks on Roosevelt Island for the collection of Wawtes. UTRC, 7-2013, http://www.utrc2.org/sites/default/files/pubs/pneumatic-waste-roosevelt-island-report-Final.pdf

Kamga, C., Miller, B. and Spertus, J. (2013), A study of the feasibility of pneumatic transport of municipal solid waste and recyclables in Manhattan using existing transportation infrastructure. UTRC, 7-2013, http://www.utrc2.org/sites/default/files/pubs/pneumatic-waste-manhattan-report-Final_0.pdf

Koning, M. and Conway, A. (2015), Biking for goods is good: an assessment of CO_2 savings in Paris. In *Transportation Research Board 94th Annual Meeting* (No. 15-0114),

Mu, S. and Dessouky, M. (2011), Control rules for dispatching trains on general networks with multiple train speeds, *Epstein Department of Industrial and Systems Engineering, University of Southern California, Los Angeles, CA,Working Paper-2012-01*.

Rodrigue, J-P. (Ed.), (2013), *The geography of transport systems*, Third Edition, London: Routledge.

Rodrigue, J-P. (2013), Urban goods transport, in *Planning and design for sustainable urban mobility: global report on human settlements 2013,* United Nations Human Settlements Programme, London: Earthscan, 57-73.

Rodrigue, J-P, Notteboom, T. and Shaw J. (Eds.), (2013), *the Sage Handbook of Transport Studies*, London: Sage, 592 pages.

Rodrigue, J-P. (2014), Manufacturing capabilities for fostering investments, World Economic Forum, Global Agenda Council. Report available at: http://www3.weforum.org/docs/Media/GAC14/Future_of_Manufacturing_Driving_Capabilities.pdf

Rodrigue, J-P. (2014), Reefers in North American cold chain logistics: evidence from Western Canadian supply chains, The Van Horne Institute, University of Calgary. Report available at: http://vanhorne.info/files/vanhorne/reefers-in-north-american-cold-chain-logistics-evidence-from-western-canadian-supply-chains.pdf

Rodrigue, J-P. (2014), The Structuring effects of rail terminals, in C. Comtois and B.P.Y. Loo (eds) *Railway Renaissance: Issues and Challenges*, Ashgate, Transport and Mobility series, in press.

Seo, S., Hyukku, K., and Chanjin, A. (2013), *Investigation and study on appropriate industries and regions for introducing Logistics Collaboration*, Korea: Ministry of Land, Infrastructure and Transportation (written in Korean).

Seo, S. (2014), Visions and development directions for sustainable urban logistics system in future cities. *KOTI Logistics Brief*, 37, 6-10.

Seo, S., H. Kwon, K. Kim, T. Kwon, H. Park, and C. Ahn (2014), *Planning public support policy of management, performance evaluation, and system improvement for urban and regional consolidated logistics activities*, Korea: Ministry of Land, Infrastructure and Transportation (written in Korean).

Seo, S., H. Kwon, T. Kwon, and H. Park (2014), *Issues and policy strategies of large-scaled logistics hubs and facilities in Korea: field survey on major freight generators and its key findings,* The Korea Transport Institute, 2014-17, in press.

Papers under review

Chen, Q. and A. Conway (2015), Commercial vehicle parking availability and behavior for residential delivery in New York City, In review for *Transportation Research Record/TRB Annual Meeting*.

Conway, A., N. Tavernier, V. Leal-Tavares, N. Gharahmani, L. Chauvet, M. Chiu, and X. Yeap (2015), Freight in a bicycle-friendly city: an exploratory analysis,In review for *Transportation Research Record*.

Koning, M. and A. Conway (2015), The good impacts of biking for goods: lessons from Paris City, In review for *Case Studies in Transport Policy.*

Zhou, W., Wang, X., Conway, A., and Chen, Q. (2015), The hidden factors influencing urban freight transportation efficiency: a study of freight vehicle load factor and temporal distribution in New York, In review for *Journal of Transportation Engineering*.

3.18.2 Theses and Dissertations

The urban freight related graduate degree programs of the MF partner universities do not require a masters thesis, hence there are none to report. We list here the completed dissertations that are within the topic area of urban freight, and the PhD students currently working on urban freight dissertations.

PhD Graduates

Afshin Abadi, PhD in Electrical Engineering, USC, "Optimum Multimodal Routing Under Normal Condition and Disruptions."

Qian An, PhD in Industrial and Systems Engineering, USC, "Evaluating City Logistics Using Two-Level Location Routing Modeling and SCPM Simulation."

Jialei Cheng, PhD in Civil Engineering, CCNY, "Performance Measures for Sustainable Urban Freight Delivery."

Harsha Honnappa, PhD in Electrical Engineering, USC, "Strategic and Transitory Models of Queueing Systems."

PhD Dissertations and student research

Adeline Heitz, Department of Planning Mobility and Environment, IFSTTAR, U Paris-Est, analysis of the evolution of the location of warehouses in metropolitan areas at different scales (city center, region, "megaregion").

Adrien Beziat, Department of Planning Mobility and Environment, IFSTTAR, U Paris-Est, freight and road congestion, microscopic and macroscopic

Felipe Vital, Electrical Engineering-Systems, USC, simulation models and test bed.

George Lymperopoulos, Electrical Engineering-Systems, USC, simulation models and test bed.

Lunce Fu, Industrial and Systems Engineering, USC, improving rail scheduling and routing through dynamic headway control.

Pierre Camilleri, Department of Planning Mobility and Environment, IFSTTAR, U Paris-Est, use of electric commercial vehicles for deliveries in large European cities

Pierre Launay, Department of Planning Mobility and Environment, IFSTTAR, U Paris-Est, sub-contracting in the urban freight transport sector

Quanquan Chen, Civil and Environmental Engineering, CCNY, understanding freight access to residential land uses in NYC and its impacts

Sanggyun Kang, Urban Planning, USC, "Unraveling warehousing decentralization trends in US metropolitan areas."

Yanbo Zhao, Electrical Engineering-Systems, USC, simulation modeling and applications to traffic light control with truck priority and load balancing.

Yihang Zhang, Electrical Engineering-Systems, USC, simulation models and combined lane change and variable speed control algorithms and impact on trucks.

Quan Yuan, Urban Planning, USC, impacts of freight corridors on local communities

Nate Hutson, Urban Planning, USC, economic development strategies, infrastructure, and supply chain efficiencies.

3.18.3: MF Papers and presentations at 2015 International Urban Freight Conference (I-NUF)

Title of Paper	Author
A Cost-Effective Smartphone Solution for Traffic Management in Marine Ports	Aliasgari, Mehrdad
Supply Chain Planning Models under Possible Job Actions	Benli, Omer
A Comprehensive View of Goods Transport Systems - Typology and Analysis of Delivery Tours in the Paris Region	Beziat, Adrien
Modeling the Effect of Congestion on Passenger and Freight Transport in the Paris Region, using OD Matrices for Freight and Passenger	Beziat, Adrien
Investigation of Machine Learning for Countermeasure of Radioactive Material Smuggling	Chang, Chin
Commercial Vehicle Parking Availability and Behavior for Residential Delivery in New York City	Conway, Alison
Human-Powered Cargo Cycle Operations and Impacts: Lessons from Paris and New York	Conway, Alison
Urban Freight in a Multi-Modal City: Curb Space Demand and Usage in New York	Conway, Alison
How Do Planning Practitioners Address Freight Transport and Logistics Sprawl? Case Study in Los Angeles	Dablanc, Laetitia
Impacts of Environmental Access Restrictions on Freight Delivery Activities: The Example of Low Emission Zones in Europe	Dablanc, Laetitia
Measuring the Business Performance of Transportation and Logistics Companies	Fawcett, James
Dispatching Trains through Double Track Rail System Under Exact Travel Time Estimation	Fu, Lunce
Trucking Regulation as a Critical Supply Chain Asset in Port Complexes	Hall, Peter
Urban Integration of the Warehouses in Metropolitan Areas: The Case of the Randstad (Netherlands) and Paris (France)	Heitz, Adeline
Examining Tradeoffs Between Drayage Costs, Travel Time Reliability and Warehousing Costs in Determining Warehouse Locations in Relation to the Ports of Los Angeles and Long Beach	Hutson, Nathan
Unraveling Warehousing Decentralization Trends in U.S. Metropolitan Areas	Kang, Sanggyun
Tracking Truck Flows with Programmable Mobile Devices for Drayage Efficiency Analysis	Lam, Shui

Title of Paper	Author
Using OD Estimation Techniques to Identify Parcel Freight Determinants and Improve the Parcel Delivery Services in Korea	Lee, Jee-Sun
Financial and Non-Financial Incentives to Foster the Adoption of Electric Vans in Paris	Morganti, Eleonora
Energy Scavenging Using Piezoelectric Sensors to Power in Pavement Intelligent Vehicle Detection Systems	Mozumdar, Mohammad
The Impact of Freight Modes and Geographic Segment Sales Concentration on Financial Performance of International Transportation Firms	Qiu, Tianjiao
The Dualism of Urban Freight Distribution: City vs. Suburban Logistics	Rodrigue, Jean-Paul
The Freight Landscape: Convergence and Divergence in Urban Freight Distribution	Rodrigue, Jean-Paul
A Hybrid Heuristic Method for the Compressed Natural Gas (CNG) Truck Routing Problems with Fueling Stations	Shao, Yihuan (Ethan)
On Using Standard Values of Time in Project Appraisal: Income Equity vs. Preference Equity	Steimetz, Seiji
An Empirical Investigation of Parking Violation Behavior of Commercial Vehicles in New York City	Wang, Qian
Geography of Motor Freight Transportation and Warehousing: Analyses and Findings from Six Metropolitan Areas in the United States of America	Wang, Qian
Location of Warehouses and Environmental Justice	Yuan, Quan
Highway Traffic Flow Control with High Volume of Trucks	Zhang, Yihang
Evaluation of Traffic Light Priority for Trucks on Traffic Flow	Zhao, Yanbo
Positive Train Control with Active Communication System	Zhao, Yanbo
A Look-ahead Solution Framework for the Dynamic Vehicle Routing Problem	Zou, Han