

The Mission of the Hunter & Stephanie Hunt Institute for Engineering & Humanity:

- Develop and scale sustainable and affordable technologies and solutions addressing the challenges facing the global poor
 - Improve the standard of living of the world's impoverished communities
 - Foster market-based mechanisms that create sustainable livelihood opportunities and that respect the dignity of individuals and communities
 - Serve as a convening platform for business, academia, NGOs and governmental organizations, as well as a national and international hub for relevant programs
 - Leverage talent from various disciplines and focus on the education of engineering and non-engineering students alike
- The SMU Hunt Institute is the home of the James Pratt Collection, ESH Week, the Hunt Institute Salon and the Hunt Institute Elders.

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Dr. Eva Szalkai Csaky, Director

Tierra Getchew, Coordinator

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Climate Extremes

*A Forum on Adaptation &
Building Resilience in Texas*

Climate Extremes:

A Forum on Adaptation & Building Resilience in Texas
September 17, 2015

An official conference of the program French Ameri-Can Climate Change Talks (FACTS), Office for Science and Technology, Embassy of France in the U.S.
An official conference of COP21 Paris, the United Nations Conference on Climate Change, December 2015



The Martha Proctor Mack Ballroom Southern Methodist University, Dallas

Broadcast live on smu.edu/live



Dr. Eva Csaky, Director of the Hunt Institute for Engineering & Humanity, SMU Lytle School of Engineering



The Hon. Sujiro Seam, Consul General of France in Houston

Welcome to the Conference!

We're delighted that you have joined us today for this critical program on climate extremes—the impacts, and what we can do about it.

Your presence here signals not only your commitment to learn the facts of climate extremes but also represents your willingness to take action as both a local and global citizen.

Our goal today is to engage you: personally, professionally and communally.

The mission of the SMU Hunt Institute for Engineering & Humanity is all about exploring and enacting sustainable and affordable technologies and solutions that address the challenges facing the global poor.

Today's conference is a truly global and local collaboration between governments and cities, between academia and industry, between students and professionals.

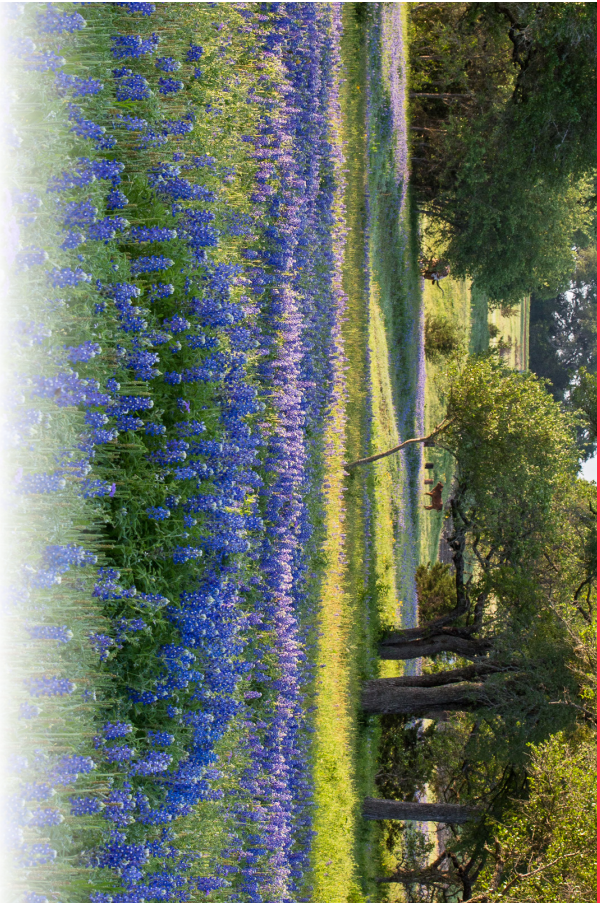
This conference is one of the French Ameri-Can Climate Talks (FACTS), organized by the French Embassy in Washington on the road to COP21, the Global Conference on Climate Change that France will host in Paris in December. FACTS provide a unique opportunity to understand why it is important and how it is possible to act against climate extremes, from the local to the global level, culminating at COP 21, where and when world leaders will have to agree on a ambitious global deal on climate.

We hope that you will feel this fusion in the room today—and that the take-aways you'll emerge with—represent a new definition of what's possible as, together, we address the issue of extreme climate at home and abroad.

This conference would not have been possible without the support of our three major sponsors, Earth Day Texas 2016, Schneider Electric and Air Liquide Electronics. We're also most grateful to our many other conference sponsors and partners listed in our program.

Finally, on behalf of all of us at SMU, to Hunter & Stephanie Hunt, thank you.

2015 SPONSORS



Opening Remarks

Dr. Eva Csaky, Director of the Hunt Institute for Engineering & Humanity and Research Professor, SMU Lytle School of Engineering

Dr. Harold Stanley, Interim Provost, Southern Methodist University

The Hon. Sujiro Seam, Consul General France (Houston)

The Hon. Mike Rawlings, Mayor of Dallas

Panel One: Impact of Climate Change in D FW/Texas

Audience Q&A

Break

Panel 2: Climate Change Solutions
Audience Q&A

Luncheon Program

Climate Change and the Inclusive Economy, an Introduction
Special Remarks: Trammell S. Crow
Keynote Remarks: Patrick Caron

Summary and Closing Remarks

Eva McCabe

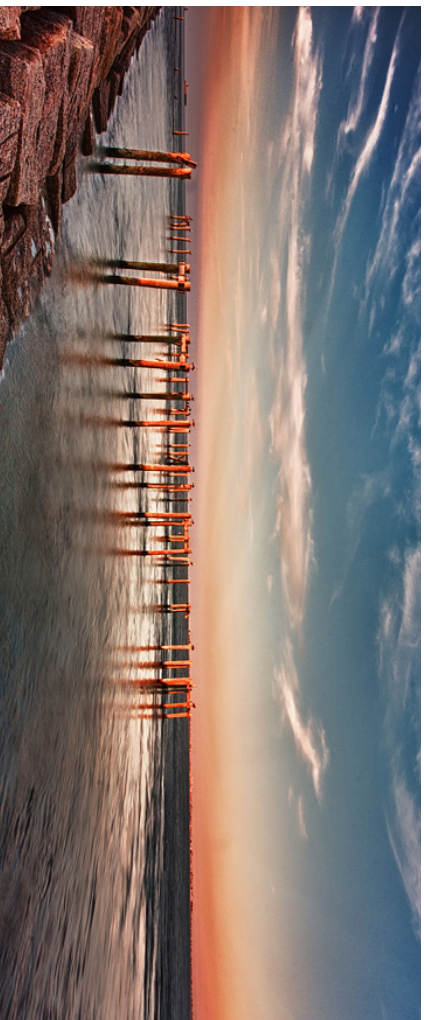
Droughts, floods, extreme heat, bitter cold—weather extremes in Texas are now an established fact of daily life for all residents of the state. How are we to adapt to these climate extremes and their impact on water supply, infrastructure, public resources and vulnerable populations? What strategies can the public and private sectors collaboratively engage in to prepare for such seesawing climate extremes? What can I, as an individual, accomplish to help address the underlying issues of climate extremes?

The SMU Hunt Institute for Engineering & Humanity, along with generous sponsors and community partners, is pleased to present this half-day program—an official conference of COP21 Paris, the United Nations Conference on Climate Change, set for December 2015. The conference is part of a series of sessions called “FACTS: French AmeriCan Climate Talks,” which are being organized by the Embassies of France in both Canada and the United States. Today’s program is being broadcast live online at smu.edu/live and will be archived.

Our focus today is purposely inclusive of both the global and local scenes related to climate extremes. We are delighted to

have the Consul General of France, the Hon. Sujito Seam (Houston), and the Mayor of Dallas, the Hon. Mike Rawlings to set the stage for the conference. Then, you’ll hear from two remarkable panels of experts—six individuals whose scholarship and work in the area of climate extremes have contributed significantly to the understanding of this vital public issue. The esteemed Dallas journalist Lee Cullum, who will ensure plentiful audience Q&A, will moderate the panels.

The conference will proceed with a “working” lunch. Hunt Institute Director Eva Casby will introduce a new working paper on the topic of climate extremes and the inclusive economy. Trammell S. Crow, Founder of Earth Day Texas, will give some brief special remarks before an address by our keynote speaker, Patrick Caron, Director General in charge of Research and Strategy at CIRAD, a French agricultural research and international cooperation organization working for the sustainable development of tropical and Mediterranean regions. A brief summary of the morning’s takeaways and closing remarks will conclude the conference—and, we hope, launch new conversations on climate extremes.



Joel Olivas



unknown/fd



Dr. Eva Caskey – Dr. Caskey is the Director of the Hunt Institute for Engineering & Humanity. Dr. Caskey has worked in the area of international development for 20 years with experience in two dozen countries around the world, specializing in market-based solutions for poverty alleviation and environmental challenges.



Dr. Harold W. Stanley – Provost and interim since June 1, Dr. Stanley is a distinguished political scientist with special expertise in American government, Southern and Latino politics and presidential elections. Dr. Stanley is the Centurion Distinguished Chair in American Politics and Political Economy in SMU's Dedman College of Humanities and Sciences.



The Hon. Sujiro Seam – Sujiro Seam is the Consul General of France in Houston and has served in a variety of capacities for the French Government, including Ministry of Foreign Affairs, Deputy Assistant Secretary for food security and economic development, and Principal Deputy Assistant Secretary for Global Public Goods.



The Hon. Mike Rawlings – As the Mayor of the City of Dallas, Mike Rawlings has launched a number of city-wide programs aimed at elevating Dallas nationally and internationally through a major economic growth plan, a new arts initiative and programs aimed at curbing poverty, homelessness and domestic violence.

Panel One : The Impact of Climate Change on DFW Region & Texas

Panel One will focus on the changing climate patterns experienced in Texas and explore their economic and social implications. It is well established that Texas has been experiencing more heat and changing rainfall patterns. The panel focus will be on areas in which the impact of these changes is most significant such as water, agriculture, tree cover, housing and pressure on the electricity grid. Panelists include (in order):



Dr. Bruce McCarl – Dr. McCarl is a Nobel Peace Prize-winning agricultural economist from Texas A&M University where he studies the economic implications of global climate change.



Russell Laughlin – Mr. Laughlin has spent 33 years in land and real estate development and serves as the SVP of Hillwood Properties and as President of the Northern Trinity Groundwater Conservation District Board.



Janete Moner – Ms. Moner is the President and CEO of the Texas Trees Foundation and an advocate for planting trees and maintaining urban forests in North Texas.



Lee Cullum, Moderator – Lee Cullum is a journalist, commentator, political analyst, and host of CEO, a long-running television series on KERA-TV (Ch. 13-PBS) in Dallas-Fort Worth. She can be seen and heard regularly on the PBS News Hour and NPR's All Things Considered.

Panel Two: Climate Extreme Solutions

Panel Two will explore and discuss adaptation and resilience, with a focus on solutions under implementation in the Southwestern U.S., Texas and the Dallas-Fort Worth area. Public infrastructure, urban agricultural food production, water conservation, creative approaches to energy management and distribution, and green/sustainable products will be examined.



Jill Jordan – Serving as the current Dallas Assistant City Manager, Ms. Jordan oversees the Office of Environmental Quality, Public Works & Transportation, Street Services, and Equipment and Building Services. She also serves on the Advisory Board for the Environmental Science program at UT Arlington.



Garrett Boone – Mr. Boone is the Co-Founder and Chairman Emeritus of the Container Store and Chairman of the Board of TreeHouse, an Austin-based green home products retail store.



Drew Byrd – Mr. Byrd is the Cities & Urban Infrastructure Program Director for Schneider Electric where he develops resilient, sustainable infrastructure to allow accelerated economic growth and business performance.

Lee Cullum, Moderator

Luncheon Program



Trammell S. Crow – Trammell S. Crow is the President of the Crow Family Foundation, Founder of Earth Day Texas, and a founder of Texas Business for Clean Air.



Patrick Caron – Patrick Caron is the Director General in charge of Research and Strategy at CIRAD, a French agricultural research and international cooperation organization working for the sustainable development of tropical and Mediterranean regions.

Summary Remarks:



Chris Kelley – Mr. Kelley is the Communications Director for the Hunt Institute for Engineering & Humanity and works with Hunter & Stephanie Hunt on a variety of initiatives and programs focused on refugees, poverty alleviation, education, and economic opportunity for under-resourced communities.

Did you know?

Did you know that due to climate change, Texas will experience:

4,500 additional heat-related deaths per year

Doubling of days per year with temperatures exceeding 95 degrees
— from 43 days to 106 days

2-foot sea level rise in Galveston

\$650 million-per-year increase in storm-related losses along the coast

Heat waves that will be more intense, more frequent and longer lasting

Longer periods between rain fall events

An increase in hurricane peak wind intensities

Did you know?



Sources:

Texas Tribune: <https://www.tribune.org/2015/07/28/study-climate-change-high-heat-waves/>

"Come Heat and High Waves: Climate Risk in the Southeastern U.S." edited by Kate Gordon of the Chicago-based Paulson Institute

RiskBusiness.org: <http://riskbusiness.org/index.php?page=risksoutheast-report&article=summary>

Adam Baker

The Inclusive Economy:

Collaborating for Market-Based Solutions or Inclusive Economic Development

About this Report

The Inclusive DFW Consortium aims to collaborate, educate, and innovate for inclusive economic development in North Texas. This inaugural working paper focuses on challenges and solutions for climate adaptation, a growing area of concern for businesses and residents, particularly those from low-income communities. This working paper synthesizes research from leading academicians and expert practitioners in inclusive economic development, sustainable development, urban planning, and social and financial innovation.

For more information and to download the complete report, visit www.inclusivedfw.org.

Co-Authors

- Anna Clark, Lead Writer, President, EarthPeople Media
- Eva Casaky, Ph.D., MSF, Director of the Hunt Institute, SMU Lyle School of Engineering
- Cynthia Cook, Executive Director, Trinity Waters
- Ann Damm, Independent Environmental Advocate
- Katharine Hayhoe, Ph.D., Associate Professor in the Public Administration program and Director of the Climate Science Center, Texas Tech
- Jesse Hull, President, Imagine Aquaponics
- Fouad Jabir, Ph.D., Associate Professor and Extension Specialist in Integrated Water Resources Management, Texas A&M AgriLife Extension Service
- Yekang Ko, Ph.D., Assistant Professor in the Department of Planning and Landscape Architecture, University of Texas at Arlington
- Owen Lynch, Ph.D., Associate Professor of Communication Studies, SMU; Director of Research and Collaboration at Get Healthy Dallas
- Janette Monrath, CEO, Texas Trees Foundation
- Theresa O'Donnell, Chief Resilience Officer, City of Dallas

- Martin Loveland Schneider, Real Estate Developer and Sustainability Consultant

- Suzanne Smith, MBA, Founder and Managing Director, Social Impact Architects

- Michael Sorrell, Ph.D., President, Paul Quinn College

- Jonathan Stolk, PhD, Executive Director, Caruth Institute for Engineering Education, SMU Lyle School of Engineering

- Lone von Herbing, PhD, Associate Professor and Director of the Marine Conservation and Aquatic Physiology Lab, University of North Texas

- Jessie Marshall Zarzaga, RIBA Lead/AP Adjunct Professor Sustainability & Development, SMU Lyle School of Engineering

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FOREWORD

By Eva Casaky, Ph.D., MSF, Director of The Hunt Institute for Engineering and Humanity

Climate change is increasing the frequency and magnitude of extreme weather events such as droughts, heat waves, floods, and storms. Around the world, climate change hits the poorest people the hardest, those living in vulnerable areas with the fewest resources to help them adapt or recover quickly from shocks¹. As the effects of climate change worsen, escaping poverty becomes more difficult, warranting even Pope Francis' emphasis on the threat that climate change represents to the world's poor.

While climate change is a global phenomenon, its negative impacts are most severely felt in the least developed countries,

which are highly dependent on natural resources². But the poor in more affluent countries like ours are not immune either. For example, impoverished urban neighborhoods in the U.S. have generally been found to be warmer than their more affluent counterparts due to fewer trees and poor quality buildings that retain heat. With residents of lower income areas less likely to be able to afford air conditioning and more likely to work outdoors, there are consequences on health and productivity³.

We in Texas have been experiencing increasing heat waves and changing rainfall patterns⁴. The severity of the situation is expected to increase in the coming two decades with the risk of significant drops in agricultural yield and labor productivity, loss of trees, higher energy demand, and rising heat-related mortality rates along with increased sea level rise⁵.

Climate change creates new urgency for addressing the problem of poverty. But the scale of the problem is vast. It is essential that the resources of the private sector and markets at large be leveraged for sustainable solutions. Market-based solutions around the world have demonstrated the profound potential for inclusive business models that not only benefit the less privileged by serving them with products and services, but also by creating economic opportunities for them as producers and workers. Market-based solutions represent considerable new business opportunities for large and small enterprises alike.

During my 18 years at the World Bank, I experienced the power of market-based solutions in many countries around the world. They have the potential to result in transformational impact by solving pressing environmental and social problems simultaneously as you will see in some of the examples in this paper. Among the most successful examples that I have seen, almost all required innovation and collaboration across disciplines, and among the private, public and nonprofit sectors. Thus the purpose of this paper is to start a conversation between professionals across sectors and disciplines on how we can collectively contribute to the development of market-based solutions for climate change adaptation, and an inclusive economy in Texas. I am thrilled to be in Dallas at the Hunt Institute where so many talented people are dedicated to

improving the lives of the less privileged. Please join us in this effort by participating in the Inclusive DFW Consortium.

Executive Summary

We are living in an era marked by substantial gains in human wellbeing, but also by rising income inequality and persistent jobless growth. Since 1990, the income, wealth, and educational attainment of residents in the most privileged neighborhoods in the United States have escalated rapidly while residents of the most disadvantaged neighborhoods have often grown poorer⁶. Dallas-Fort Worth, the fourth largest metropolitan area in the nation, represents the sixth largest gross metropolitan product (GMP) in the United States and the tenth largest in the world. Despite this prosperity, Dallas-Fort Worth ranks third in poverty in the nation, and first in terms of inequality⁷.

Increased and prolonged income inequality leads to slow growth, less innovation, and under-utilization of a region's most important asset: human capital⁸. In Dallas, the disparity of opportunity is apparent in the contrast between its northern and southern sectors. In North Dallas, the median household income is \$131,058; in South Dallas' Fair Park neighborhood, it is \$14,721⁹. As Mayor Mike Rawlings' poverty risk force reveals, Dallas has the highest child poverty rate among cities larger than 1 million people. The city also has the third-highest overall poverty rate among large cities, and two of every five kids grow up poor¹⁰.

North Texas is a land of extremes in terms of weather also. Drought and flood, heat and ice storms, dust storms and hurricanes: Texas has it all. Because of our extreme weather, many might wonder, "Why worry about climate change?" The answer is that climate change is not merely one more event, but a phenomenon that accelerates the effects and consequences of extreme weather and related events. Climate change matters because the risks of many of these events are shifting. Stronger heat waves, more frequent extreme rain events, and stronger storms are all climate risks faced by this region.

In fact, Dallas also has one of the most rapidly growing heat

Selected Bibliography

- Rugh, C. (2014). NCHRP Synthesis 454: Response to Extreme Weather Impacts on Transportation Systems. A Synthesis of Highway Practice. Washington, D.C.: Transportation Research Board of the National Academies.

- ISR. (2015). Business Leadership Forum Inductive Economy: A Framework for Collaboration and Impact. Retrieved from <http://www.bh.org/online-enlightenment/business-leadership-for-an-inclusive-economy-of-futures-work-for-collaboration>

- Dallas Morning News. (2015). Why Conservatives Can Embrace Obama's Cool Plan For Bad Air. Retrieved from <http://www.dallasnews.com/business/advertorial/20150804-dw-by-conservatives-embrace-obamas-good-plan-for-bad-air-ec02kmmw2d1e>

- Houston Advanced Research Center. Proposal for U.S. Environmental Protection Agency. (2009). Dallas Urban Heat Island. Dallas Sustainable Systems Initiative. Retrieved from http://www.sustainablecities.org/TAF/Document/Dallas_Urban_Heat_Island_Report.pdf

- KPMG. (2012). Expect the Unexpected: Building Business Value in a Changing World. Retrieved from <http://www.kpmg.com/US/issuesandinsights/articlesadvice/sustainable-environment/expect-the-unexpected-building-business-value-in-a-changing-world.aspx>

- The World Bank. (2012). Inductive Green Growth: The Pathway to Sustainable Development. Kye. Retrieved <http://www.worldbank.org/inductivegreen>

- Porter, M., Hills, G., Pitzer, M., Rauchbeis, S., & Houtaris, E. (2011). Measuring Shared Value: How to Check Value by Linking Social and Business Results. Retrieved from <http://www.mckinsey.com/our-insights/creating-shared-value>

- Stone, Philip. (2012). The City and the Coming Climate: Climate Change in the Places We Live. New York: Cambridge University Press.

- Texas Trust Foundation. (2015). State of the Dallas Urban Forest Report. Retrieved from <http://www.txtrust.org/>

- Texas Work-Open for Business. Office of the Governor, Economic Development and Tourism. (2014). The Texas Renewable Energy Industry. Retrieved from http://gov.texas.gov/Reck/energy/renewable_energy.pdf

- The Risky Business Project. (2014). Risky Business: The Economic Risks of Climate Change in the United States. Retrieved from http://riskybusiness.org/pdf/riskylife/business_report_UWEB_S04_14.pdf

- The Risky Business Project. (2014). Climate Change and the Economy: Texas. Retrieved from <http://riskybusiness.org/pdf/riskylife/Texas-4-2-7.pdf>

- U.S. Department of Energy. (2013). U.S. Energy Sector Vulnerabilities to Climate Change and Extreme Weather. Retrieved from <http://www.eia.gov/analysis/infocus/2013/07/20130710-energy-sector-vulnerabilities-report.pdf>

- Wang, A. Lee, J., Ko, Y., and the World Council Team. Vulnerability Assessment Team. (2015). Climate Change/Extreme Weather Vulnerability and Risk Assessment for Transportation Infrastructure in Dallas and Tarrant Counties. Federal Highway Administration

Economics

1 "Working for a World Free of Poverty", The World Bank "Climate Change Complexities Efforts to End Poverty", February 6, 2015. <http://www.worldbank.org/news/pressrelease/2015/02/06/climate-change-complexities-efforts-end-poverty>

2 "Poverty and Climate Change: Reducing the Vulnerability of the Poor through Adaptation", <http://www.woed.org/en/ed/292872> <http://www.woed.org/en/ed/292872.pdf>

3 Juan Werdal. TIME. "Why Climate Change Affects Poor Neighborhood 'The Most'", October 3, 2014. <http://time.com/457868/climate-change-poor-neighborhood/>

4 Randy L. Lofgren. "Worse Global Warming Effects Ahead for Texas, Federal report says", The Dallas Morning News, May 6, 2014. <http://www.dallasnews.com/news/advertorial/2014/05/06/worse-global-warming-effects-ahead-for-texas-federal-report-says-az>

5 "The Economic Risks of Climate Change in The United States", Risky Business, <http://riskybusiness.org/index.php?page=report/inductive-environmental-summery>

6 Urban Institute, 2015

7 "World's Aged: Inequality between America's Most and Least Affluent Neighborhoods", Urban Institute, 2015 <http://www.urban.org/press-release/urban-institute-report-inequality-between-america-s-most-and-least-affluent-neighborhoods>

8 Joseph Stiglitz. "The Price of Inequality", *Norman & Company*, 2012

9 <http://www.census.gov/dhes/www/>

10 BJ Auer and Eric Aasen. "In Dallas, Poverty Has Skyrocketed Over The Past Decade", KERA News, August 21, 2014. <http://kera.com/news/post/dallas-poverty-has-skyrocketed-over-past-decade>

11 Brian Stone. "The City and the Coming Climate", 2012

12 "Adapting to Climate Change: Cities and the Urban Poor"

13 "The Economic Risks of Climate Change in The United States", Risky Business, <http://riskybusiness.org/index.php?page=report/inductive-environmental-summery>

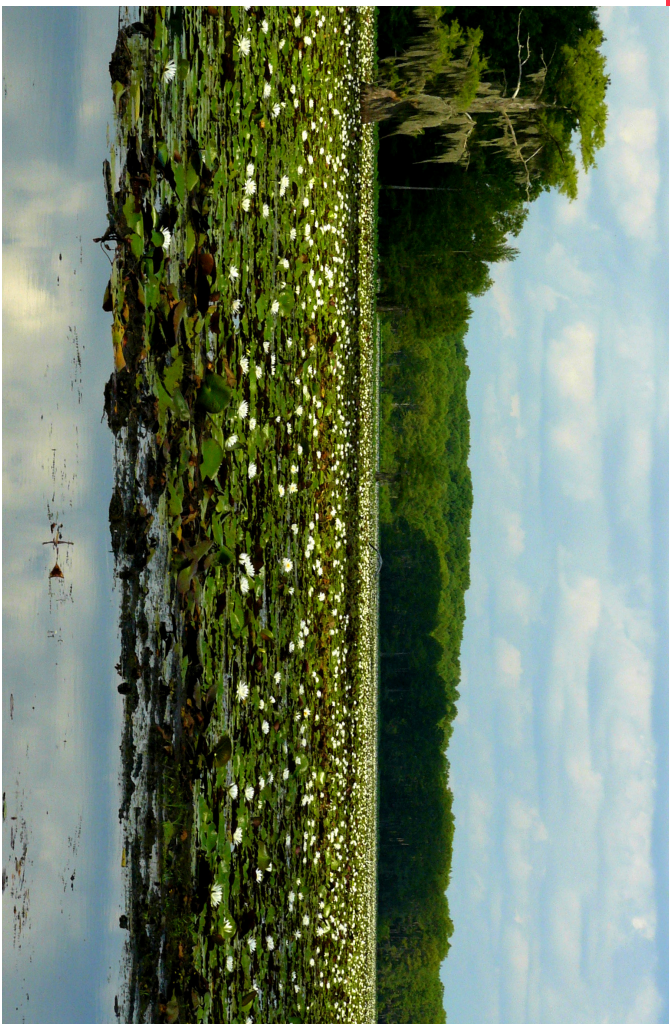
14 Dr. Haley, Professor of Internal Medicine and Director of the Division of Epidemiology in the Internal Medicine Department at UT Southwestern Medical Center, is the senior author of a study that investigated the West Nile epidemic in 2012. He presented his findings at the "City to City" conference in Dallas in 2013.

15 "Climate change adaptation: Empowerment of local and regional authorities, with a focus on their involvement in monitoring and policy design", 2013, EU and the Committee of the Regions, <http://www.europa.eu>

16 Introduction to the Local Land™, Organisation for Economic Co-operation and Development, <http://www.oecd.org/en/ed/44697202.pdf>

17 "Climate Change and Cities", First Assessment Report

18 "Business Leadership Forum Inductive Economy", ISR, 2015



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TEDxSMU brings together ideas and interesting people from around the world and around the corner. We are an independently organized TEDx event licensed by TED. Our conferences started in 2009 on the SMU campus and have since grown to year-round events for the Dallas and SMU communities. We also launched TEDxKids@SMU, the first-ever TED event designed specifically for youth.

TEDxSMU is also partnering with **EDIX** to bring monthly events to North Texas. The two organizations will co-present a film screening and discussion series in Dallas. The goal is to continue and enhance the climate conversation in North Texas by bringing thought-provoking environmental documentaries to the community all year.

Find out more at www.tedxsmu.org

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