

The logo features the word "NORDP" in a bold, white, sans-serif font. To the left of the text is a stylized network diagram consisting of several blue circles of varying sizes connected by thin white lines. One of the circles is a globe with latitude and longitude lines.

NORDP

2021

Building, Maintaining, and Sustaining Productive International Research Partnerships: Perspectives of Principal Investigators

This session is sponsored by:





- Welcome Panelists (Alphabetical Order)

- Anu Ramaswami, Princeton University

- Director, M.S. Chadha Center for Global India; Sanjay Swani 87' Professor of India Studies at
Princeton Institute of International and Regional Studies
Professor of Civil and Environmental Engineering and the High Meadows Environmental Institute

- Cathy Whitlock, Montana State University

- Regents Professor
Fellow, Montana Institute on Ecosystems
Director, MSU Paleoecology Lab

- Charles Wood, University of Nebraska

- Lewis Lehr/3M University Professor, Biological Sciences and Biochemistry



Partnerships in International Research and Education (PIRE):

Developing Low-Carbon *and Sustainable Cities* in the US, China & India through Interdisciplinary Integration

Anu Ramaswami

Lead PI & Director, NSF's Sustainable Healthy Cities Network

Lead PI & Director, Innovations at the Food-Energy Water Nexus (USDA)

Former PIRE Program Director & PI at University of Minnesota

Professor, Civil & Environmental Engineering & the High Meadows Environmental Institute

Director, M.S. Chadha Center for Global India

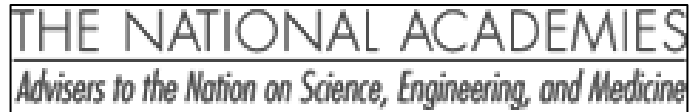
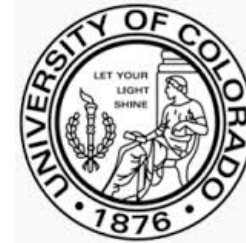
Sanjay Swani '87 Professor of India Studies

Princeton University



12 Project Partners

- PIRE US Institutions



- PIRE India Collaborators
Indian Institute of Technology, Kanpur
ICLEI South Asia

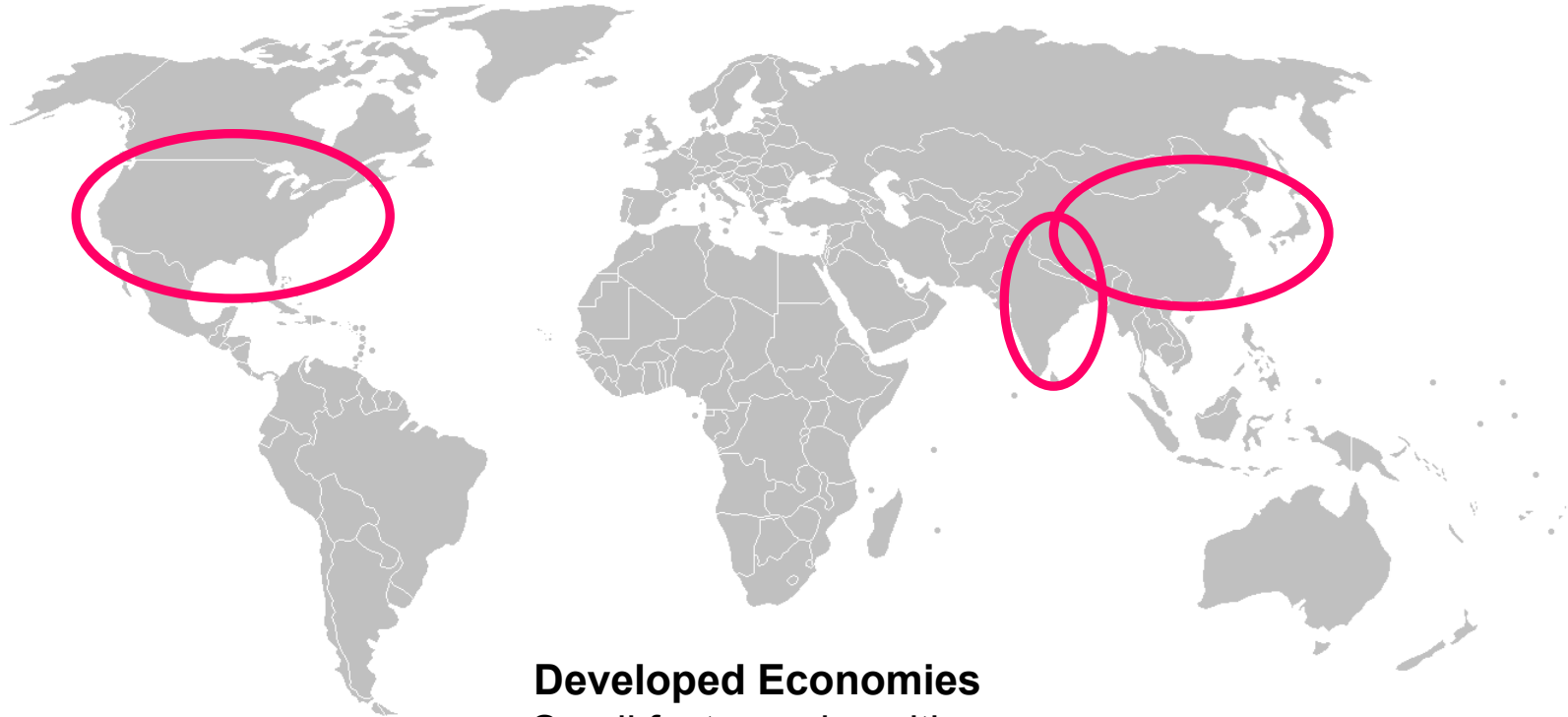


• I C L E I Local Governments for Sustainability

- PIRE China Collaborators
Tsinghua University
Chinese Academy of Sciences Institute on the Urban Environment



Developing Science & Partnerships to Inform Low-Carbon Actions in Diverse Cities in 3 Nations



Developed Economies

Small fast-growing cities

Stable aging cities

Shrinking cities

Developing Economies

Small fast-growing cities

Mega-cities with infrastructure deficits

Deeply interdisciplinary & links knowledge to action → *Convergence Science*

Rationale, Opportunities and Key Hypotheses

- Rationale
 - More than half the world's people live in cities
 - Cities effectively use more than 75% of the world's fossil energy, contribute ~80% global greenhouse gas emissions
 - People in cities (80% in US) and public health are at risk due to pollution, climate change (extreme heat, drought, floods)
- Opportunity: More than 1,000 Cities worldwide are signing on to low-carbon / climate action plans.
 - Hypothesis: Local priorities in Asian cities (water scarcity, waste releases, current air pollution and health concerns) are a greater motivator for low carbon infrastructure development than global carbon concerns per se.

Interdisciplinary SEIS Framework Links Research, Education and Outreach

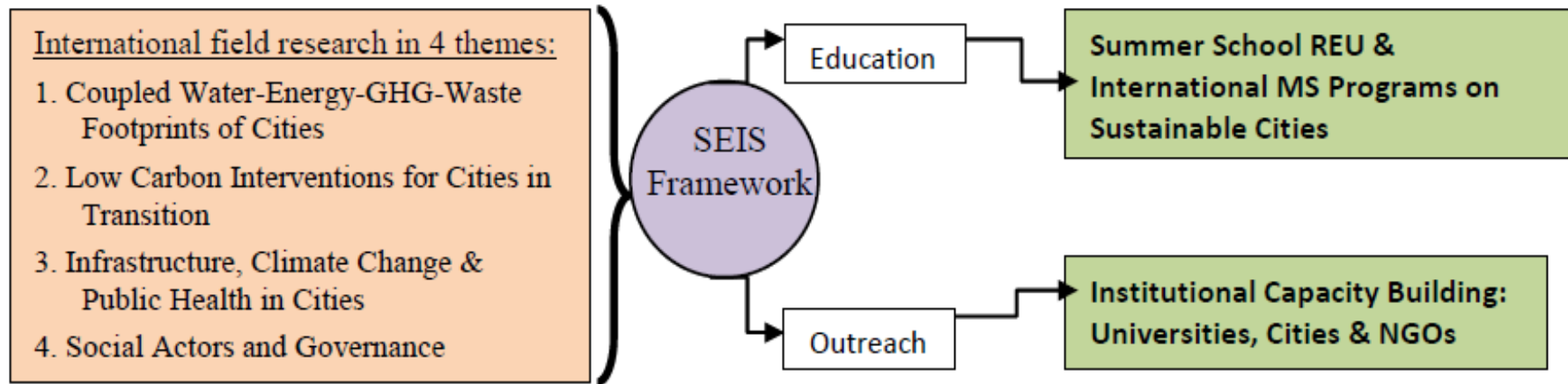


Fig 5: PIRE research organized in four themes connects with education and outreach. The proposed field research is described next (organized by themes) followed by education activities.

Example Research Accomplishment: Paper on Social Ecological Infrastructural Urban Systems

PERSPECTIVE

Meta-principles for developing smart, sustainable, and healthy cities

Anu Ramaswami^{1,*}, Armistead G. Russell², Patricia J. Culligan³, Karnamadakala Rahul Sharma¹, Emani Kumar⁴

¹Hubert H. Humphrey School of Public Affairs, University of Minnesota, Minneapolis, MN 55455, USA.

²School of Civil and Environmental Engineering, Georgia In

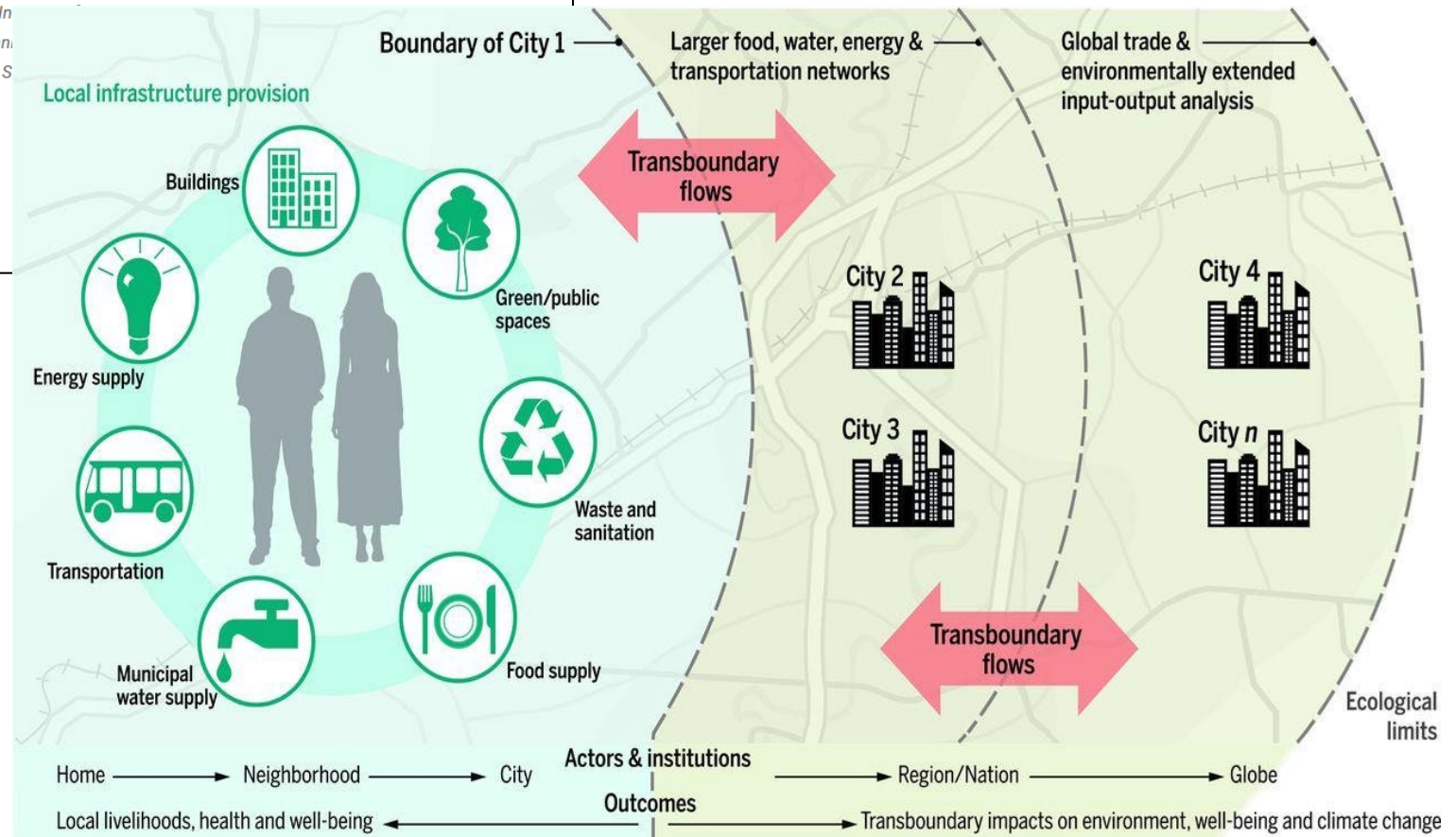
³Department of Civil Engineering and Engineering Mechan.

⁴ICLEI—Local Governments for Sustainability, South Asia S

*Corresponding author. Email: anu@umn.edu

- Hide authors and affiliations

Science 20 May 2016:
Vol. 352, Issue 6288, pp. 940-943
DOI: 10.1126/science.aaf7160



Ramaswami et al. 2016. *Science*.

Examples of Key Research Accomplishments

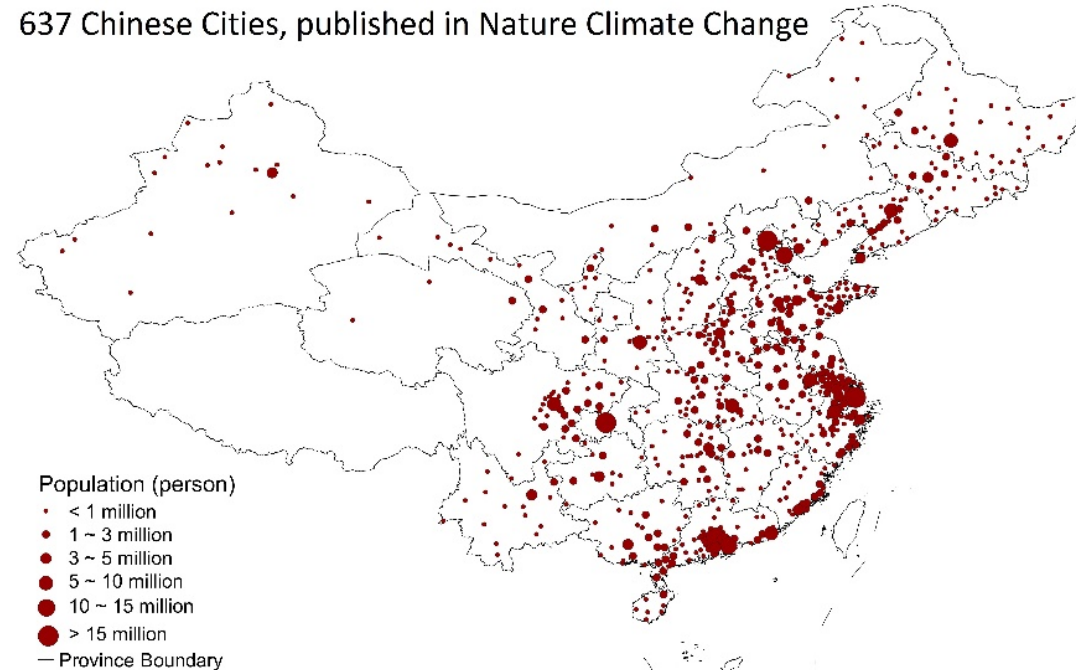
Published: 18 September 2017

Urban cross-sector actions for carbon mitigation with local health co-benefits in China

Anu Ramaswami , Kangkang Tong, Andrew Fang, Raj M. Lal, Ajay Singh Nagpure, Yang Li, Huajun Yu, Daqian Jiang, Armistead G. Russell, Lei Shi, Marian Chertow, Yangjun Wang & Shuxiao Wang



Carbon and Health Co-Benefits for Cross-Sector Actions Modeled across all 637 Chinese Cities, published in Nature Climate Change



Ramaswami et al. 2017. *Nature Climate Change*.

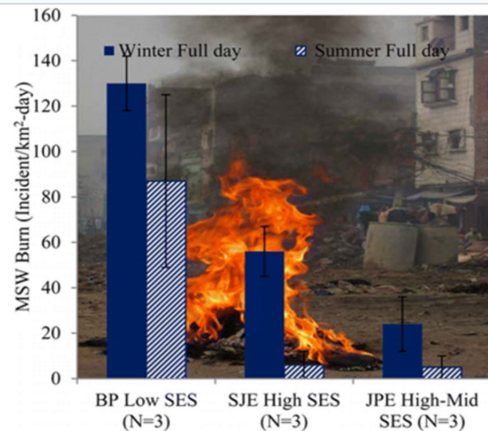
Examples of Key Research Accomplishments: Air Pollution Research in India



Key Contributions:

- First study to measure **solid waste burning in Indian Cities**; developed a field transect method and applied to Delhi and Agra, India. These data are now used by Delhi government in Delhi's air pollution inventory
 - ***Nagpure, Ramaswami & Russell, Environ. Sci. Tech; 2015***
- Quantified relative contribution of **municipal solid waste burning versus dung-cake burning** as contributors to air pollution and discoloration of the Taj Mahal → Stimulated rules in India that now ban solid waste burning [collaboration with IIT Kanpur]
 - ***Lal, Nagpure, et al., Env Res. Lett. 2016***
- Explored **social factors that impact waste burning** at the neighborhood level in Indian cities, findings suggest the role of neighborhood associations to be important
 - ***Ramaswami, Baidwan, Nagpure, Waste Management Research, 2016***

Abstract



Subsequent research:

- Review: Monitoring particulate matter in India: recent trends and future outlook
 - ***Pant et al., 2019***
- Modeling the benefits of circular economy to air pollution and health in India (Collaboration with IIT-Mumbai - ***Lal et al.***)
- Infrastructure-related Health risk in 42 Cities in India (***Nagpure & Ramaswami***)

International Education



Education & Professional Exchange: Summer School PIRE in India (2013)



Our PIRE in China: Xiamen Workshop (2014)



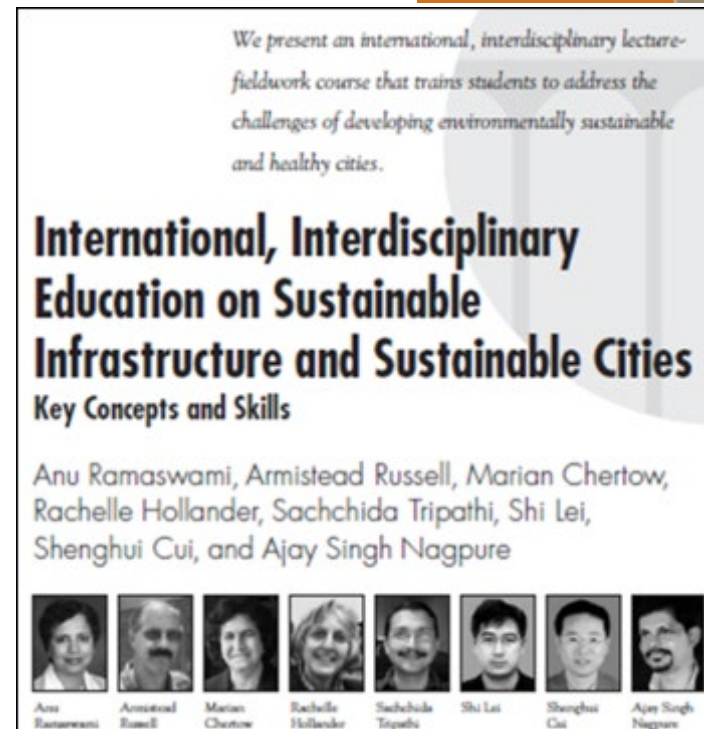
PIRE 2016: Learnings Across China & India with Mayors of All Three nations



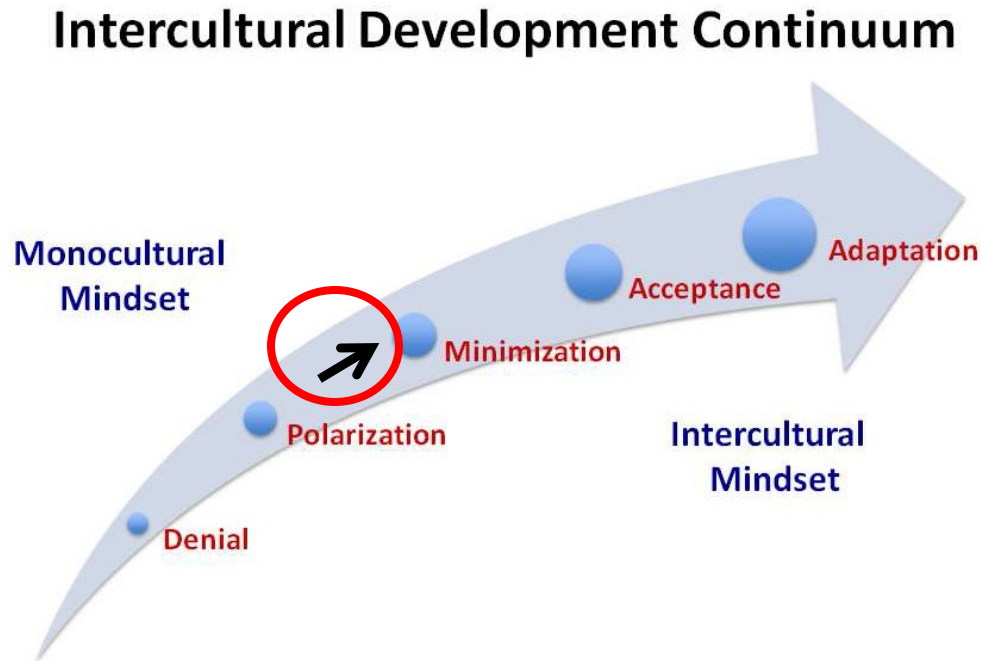
Key Learning Objectives

Our PIRE-NAE workshop articulated 5 key learning objectives for broad-based curricula on Sustainable Cities:

- Sustainability systems core concepts
- Inter-disciplinary skills
- Inter-cultural skills
- Fieldwork skills, including community-based research
- Knowledge of ethics



Education Assessment: Measurable Changes in Intercultural Learning Over 6 weeks Summer School



The intercultural development of the 2013 cohort before and after the 6-week India Summer School is shown by the small black arrow. Measured using the Intercultural Development Inventory (IDI), the cohort transitioned from the stage of Polarization (average IDI score of 95) to the cusp of Minimization (Average IDI score of 98.6) over 6 weeks.

Figure 5: The Intercultural Development Continuum (blue arrow), upon which is superimposed a small black arrow showing the development of cultural awareness that occurred over the 6-week summer school held in India, 2013. Source: Hammer, M. R., & Bennett, M., (2009)

Policy Impact: Smart City Workshop



Hosted a joint workshop on “**Smart, Sustainable Healthy Cities in US, India & China**” with 50+ City Mayors from US, China & India in Delhi, India; w/ ICLEI-South Asia

Direct Impact of Air Pollution Research on Policy

THE WALL STREET JOURNAL. INDIA

INDIA REALTIME
The daily pulse of the world's largest democracy

HOT TOPICS: H-1B VISAS BJP NARENDRA MODI FREEDOM OF EXPRESSION

3:02 pm IST
Nov 3, 2015 ENVIRONMENT

How Trash Is Adding to Delhi's Air Pollution Problems

ARTICLE COMMENTS

GARBAGE BURNING INDIA NEW DELHI

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THE TIMES OF INDIA India

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COMPLETED 2ND TEST
IND 80/0 22.0v 214 RSA
Match drawn

FROM AROUND THE WEB

RELATED KEYWORDS: University-Of-Wisconsin | Taj-Yellowing | Taj-Mahal | Municipal-Solid-Waste | Georgia-Institute-Of-Technology

Large-scale open burning of garbage damaging Taj: US study

Aditya Dev, TNN | Oct 8, 2015, 05:23 PM IST

AGRA: One of the major threats to the Taj Mahal – a high level of particulate matter (PM) responsible for masking the white marble sheen – is being released into air on account of large scale burning of municipal solid waste (MSW) in the city. A joint study by the University of Minnesota and Georgia Institute of Technology has revealed that Agra burns a whopping 24% of its waste as compared to Delhi's mere 2-3%.

According to the findings of the present study, the total municipal solid waste being burnt in Delhi on a daily basis is estimated to be about 190-246 tonnes per day out of total 8,300 tonnes generated. In Agra, it is 223 tonnes per day out of 923 tonnes.

Notably in December last year, a joint study by IIT Kanpur, Georgia Institute of Technology and University of Wisconsin had revealed that brown and black carbons along with dust are responsible for giving yellow tinge to the 17 century white marble monument. Subsequent to thereport, the parliamentary standing committee on environment passed several directions to the Agra administration to curb pollution in the city.

MSW being burnt near Kamla Nagar at NTR's service lane.

THE TIMES OF INDIA Agra

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You are here: Home » City » Agra

COMPLETED 2ND TEST
IND 80/0 22.0v 214 RSA
Match drawn

FROM AROUND THE WEB

RELATED KEYWORDS: Road | Police | Lathicharge | Garbage | Fratricide | Agra

Police lathicharge on colleagues' kin for protesting against burning of garbage

Arvind Chauhan, TNN | Nov 4, 2015, 10:02 PM IST

High level of garbage burning to blame for Taj yellowing: US study

Agra Burns 24% Of Its Municipal Waste As Compared To Delhi's 2-3%

Aditya.Dev@timesgroup.com



AGRA: One of the major threats to the Taj Mahal – a high level of particulate matter (PM) responsible for masking the white marble sheen – is being released into air on account of large scale burning of municipal solid waste (MSW) in the city. A joint study by the University of Minnesota and Georgia Institute of Technology has revealed that Agra burns a whopping 24% of its waste as compared to Delhi's mere 2-3%.

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MSW being burnt near Kamla Nagar at NTR's service lane.

quale collection and pick-up service. Jangpura had lower waste burning as compared to Safdarjung Enclave.

The inter-city comparison showed Agra to be very different, with significantly higher municipal solid waste burning frequencies and a higher mass/area compared to Delhi. For Agra, the municipal solid waste burned was observed to be much higher in three different areas that were covered – ranging from frequencies of 39 to 202 incidents per sq km per day in more wealthy areas, to 672 to 3485 kg per sq km per day in low income areas, as measured in summer 2015, the study reported.

In Agra, sampling was done in Dayalbagh, Belanganj Civil Line, Lohiya Nagar, Balkeshwar Colony, Telipada, Shaheed Nagar, Vijay Nagar Colony, some areas from ward no 23& 24, Shaheed Nagar, Chandra Nagar, Shyam Nagar, Dhandupura and Trans Yamuna Colony Block.

According to Central Pollution Control Board, PM10 level in Agra is 180, against the prescribed limit of 60. Notably while replying to an RTI query filed by TOI over Taj Mahal's restoration work recently, ASI had accepted that air pollutants, especially suspended particulate matter (SPM), after reacting with marble is masking the original colour and sheen of the monument.

When contacted, divisional commissioner Pradip Bhatnagar said the city's areas are divided between Agra Nagar Nigam and Cantonment Board. "While municipal corporation sanitary workers are doing their duties proper Cantonment Board's work is not satisfactory. We have also written to their senior officials. We will again pursue the matter."

The study then focused on the method to try to estimate waste burning across the whole city of Delhi, and also to compare with Agra. The researchers then made the Delhi estimation based on Summer-Winter data from 2014 and 2015. For Agra and Delhi – the comparison is based on summer measurements conducted between May and June in 2015.

The highest rate of 130 incidents of MSW burning per sq km was in seen in Brijpuri in Delhi that had very poor waste collection services. As expected, with no good options, waste burning incidence was high in Brijpuri in both winter and summer. The other two areas showed lower waste burning, but it was not zero, even though they did have adequate

Thank you!

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ramaswami.princeton.edu

@SRNcities
@AnuRamaswami
@RamaswamiSUSLab

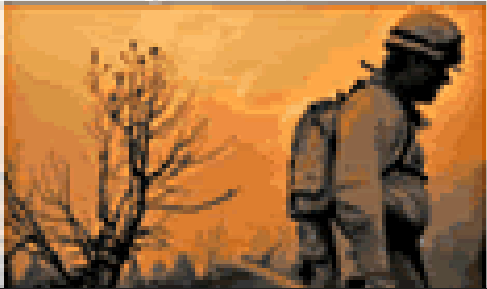


WildFIRE PIRE:

Understanding fire-climate-human linkages

(2010-2017)

High Country News



news feature

Burning issues

Australia's cities impinge upon an ancient landscape shaped by fire. Carina Dennis talks to the researchers who are striving to protect lives and property, while retaining natural fire regimes

ECOLOGY

Salvage Harvesting Policies After Natural Disturbance

D. B. Lindenmayer,¹ D. R. Foster,² J. F. Franklin,³ M. L. Hunter,⁴ R. F. Noss,⁵ F. A. Schmiegelow,⁶ D. Perry⁷



Los Angeles Times
California is primed for a severe fire season, but just how bad is anybody's guess

The wildfire factor

David Schimel and David Baker

News Focus

In a region already prone to water shortages, researchers now forecast American West's hidden reservoir: mountain snow

As the West Goes Dry

The Telegraph

Australian bushfires: Nearly 100 dead in deadliest ever blaze

Australia's worst ever bushfires have left at least 100 people dead and homeless as blazes continue to rage amid fears the death-toll could rise



Fire in the Earth System

David M. J. S. Bowman,^{1*} Jennifer K. Balch,^{2,3,4*} Paulo Artaxo,⁵ William J. Bond,⁶ Jean M. Carlson,⁷ Mark A. Cochrane,⁸ Carla M. D'Antonio,⁹ Ruth S. DeFries,¹⁰ John C. Doyle,¹¹ Sandy P. Harrison,¹² Fay H. Johnston,¹³ Jon E. Keeley,^{14,15} Meg A. Krawchuk,¹⁶ Christian A. Kull,¹⁷ J. Brad Marston,¹⁸ Max A. Moritz,¹⁶ I. Colin Prentice,¹⁹ Christopher I. Roos,²⁰ Andrew C. Scott,²¹ Thomas W. Swetnam,²² Guido R. van der Werf,²³ Stephen J. Pyne²⁴

Fire is a worldwide phenomenon that appears in the geological record soon after the appearance of terrestrial plants. Fire influences global ecosystem patterns and processes, including vegetation

Thresholds of Climate Change in Ecosystems

Land management

Forests, fires and climate

Cathy Whitlock

A new analysis of the effect of climatic variation on forest fires goes back several thousand years. One take-home message is that a one-size-fits-all forest management strategy is, literally, short-sighted

Implementation of National Fire Plan treatments near





Australian
National
University



University of Colorado
Boulder



MONTANA
STATE UNIVERSITY



University of Idaho



Landcare Research
Manaaki Whenua



UNIVERSITY of
TASMANIA
AUSTRALIA



THE UNIVERSITY OF
AUCKLAND
Te Whare Wānanga o Tāmaki Makaurau
NEW ZEALAND



New Faces

Graduate students

Cameron Naficy (Univ Colorado)
Monica Rother (Univ Colorado)
Julia Hicks (Univ Colorado)
Teresa Krause (Montana State)
Danny Schmidt (Montana State)
Laura Stahle (Montana State)
Kimberley Taylor (Montana State)
Alicia White (Montana State)
Paul Dunning (Univ Idaho)
Adam Young (Univ Idaho)
Jay Chin (ANU)
Felicity Hopf (ANU)
Buzz Nanavati (Montana State)

Postdocs

Alan Tepley (Univ Colorado)
Gabe Yospin (Montana State, Fire Sciences Lab)
Andres Holz (Univ Tasmania, ARC funded)
Sam Wood (Univ Tasmania, ARC funded)
Michael Fletcher (Aus Nat'l Univ, ARC funded)
Jesse Morris (Univ Idaho)
Virginia Iglesias (Montana State)

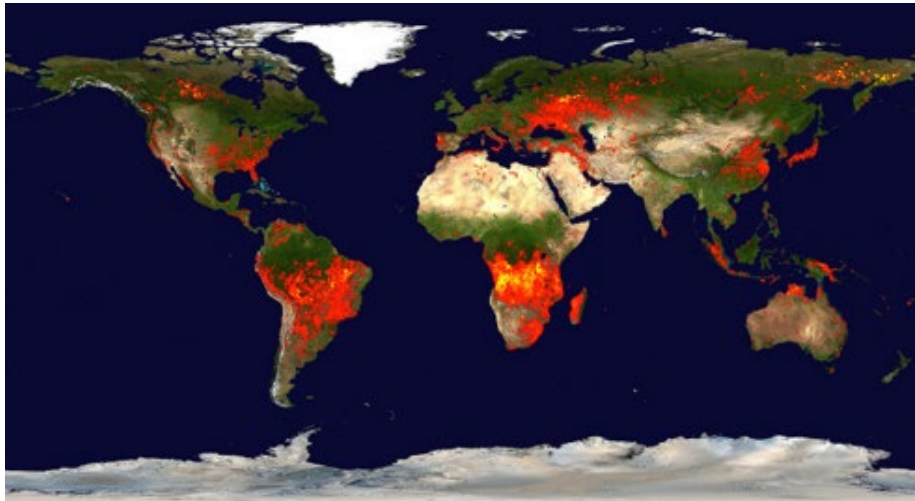
New Collaborators

Univ. Montana
Portland State Univ.
Monash Univ.
Southern Methodist Univ.
Univ. Melbourne
Univ. Balamand
Univ. Bern
Univ. Lausanne
University of Otago
Ecotono Lab, Univ. Comahue
Univ. Concepcion

Undergraduate Interns

Matthew Weingart (SKC)
Loga Fixico (SKC)
Jason Baldes (Montana State)
Jocee Sterling (Montana State)
Conamara Burke (U Idaho)
Shawn de France (SKC)
Hannah Funke (SKC)
Sam Wall (SKC)
Holland Bennett (SKC)
Javier Fernandez (TAMU)
Savannah Lozier (Montana State)
Leslie Brownrigg (SKC)
Simone Cordery-Cotter (SKC)

How do climate, vegetation/fuel, and human activities shape fire regimes?

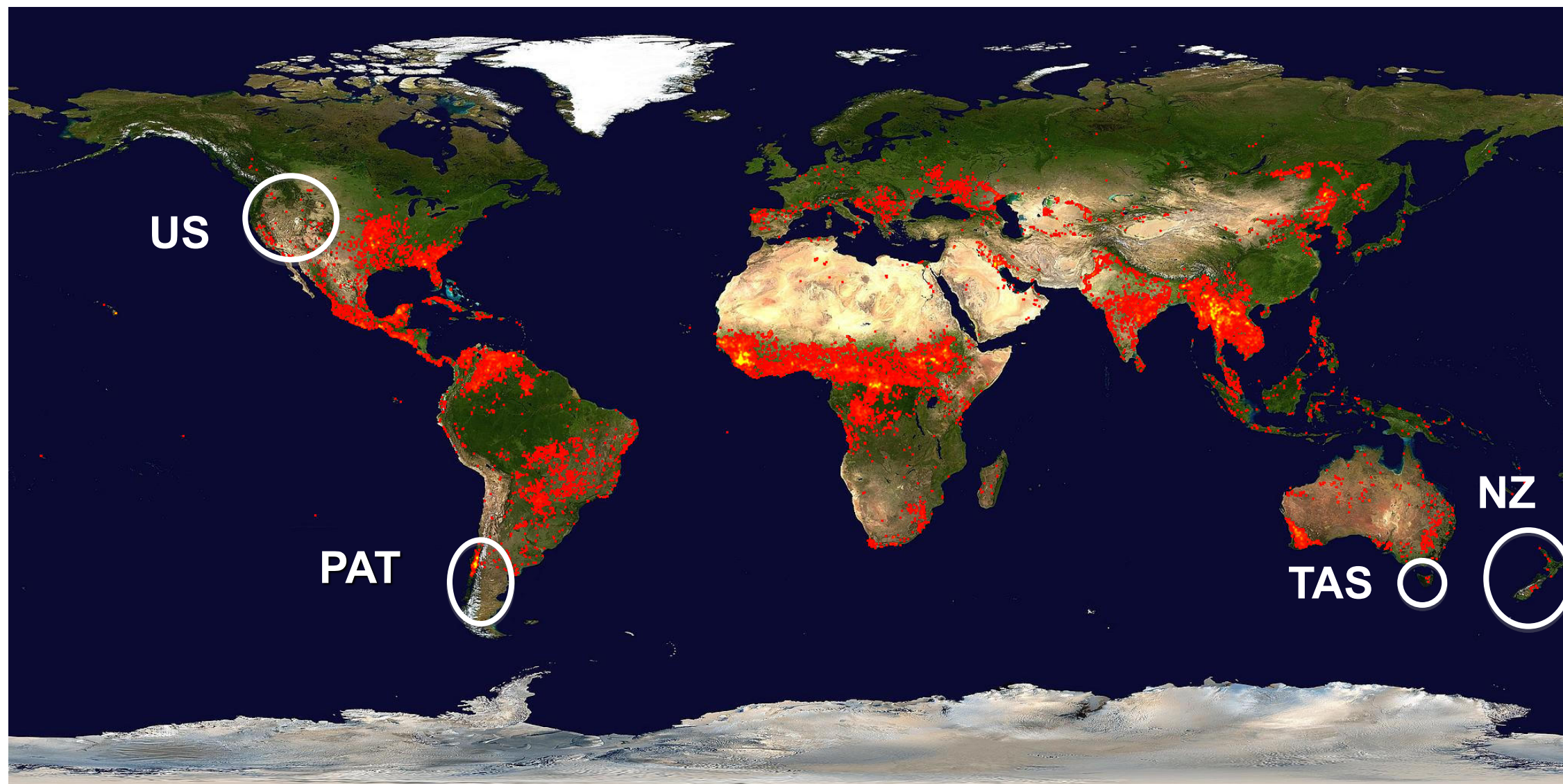


How has current global warming altered wildfires in comparison to the past?

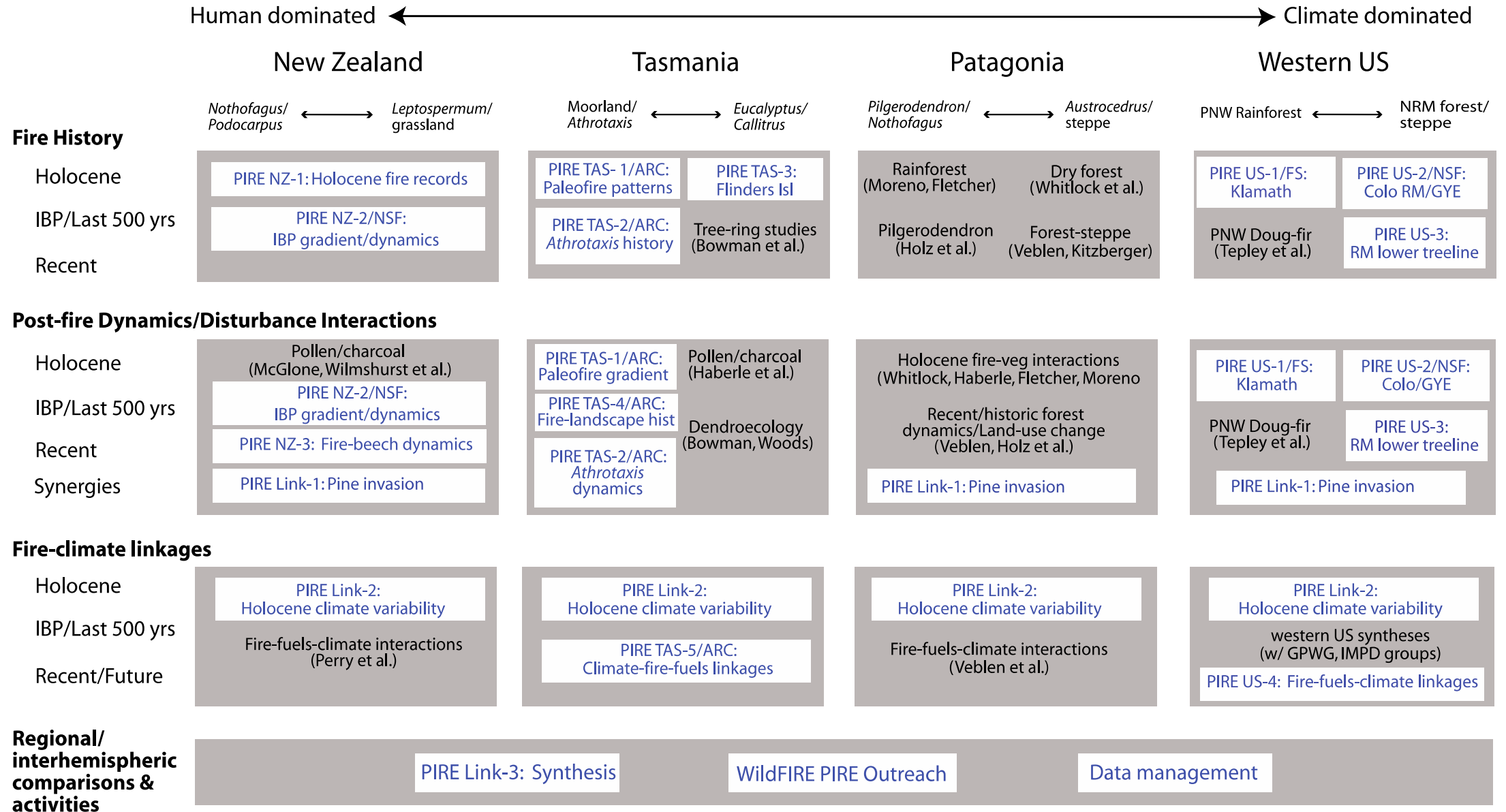
How does understanding the range of past wildfire activity inform decision making?



Study Areas



Science Plan



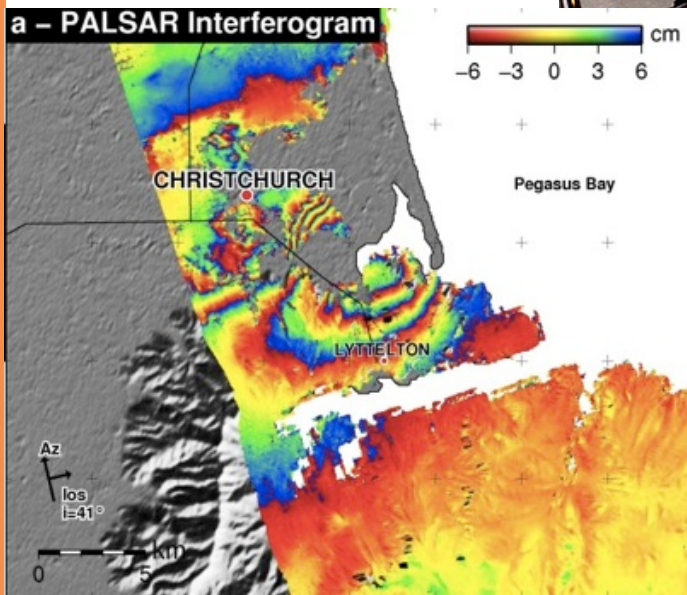


Communication

- US meetings (annual)
- International All-hands meetings
- Joint field & lab time
- Off-site conferencing at professional meetings
- Joint faculty advising
- Bimonthly video meetings
- E-mail, twitter, blogs

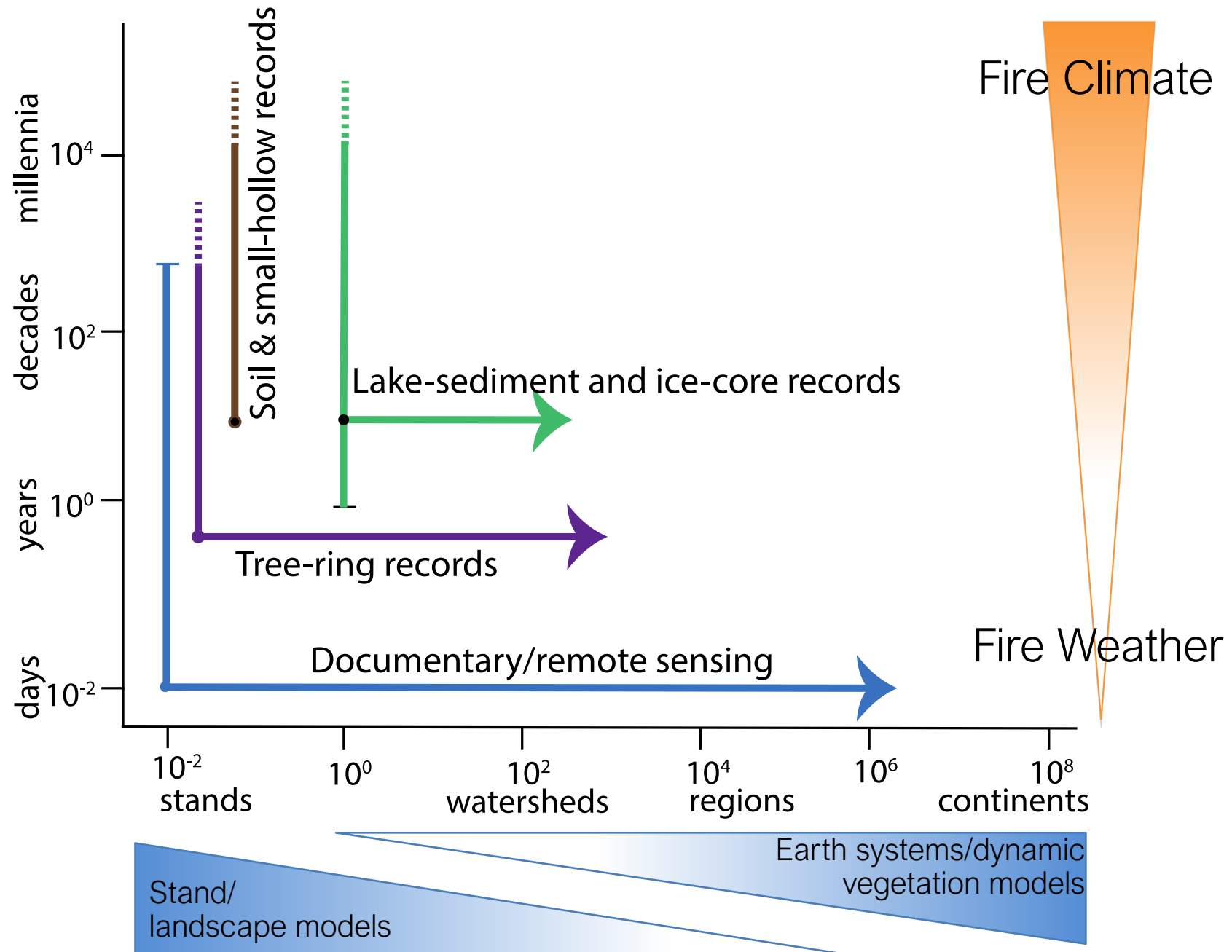


Challenges



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SCIENCE





credit: Goodshort — own work



credit: Scott Bischke

Research Metrics

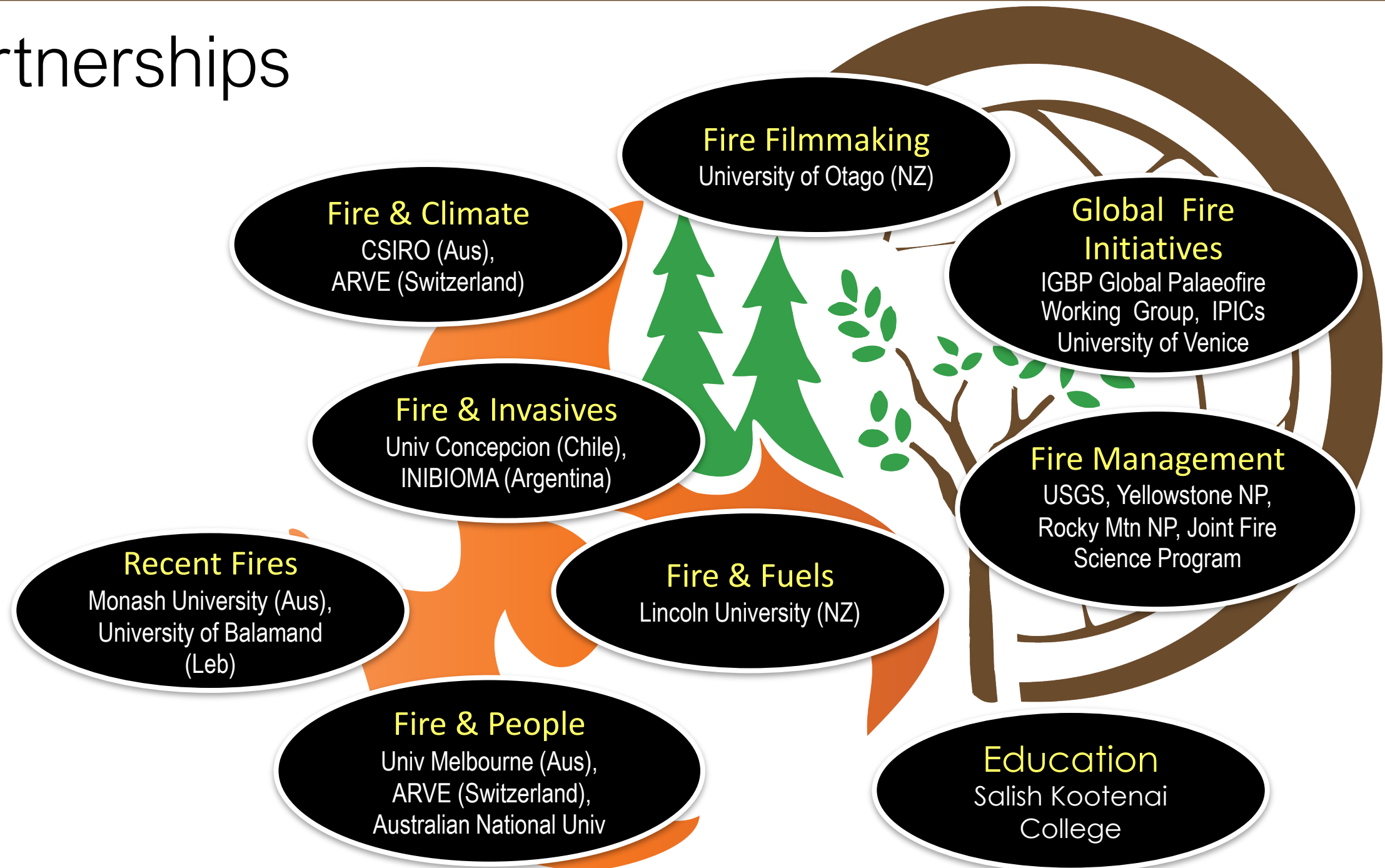
- ✓ 121 peer-review journal articles, including synthesis papers
- ✓ 19 chapters in important fire volumes
- ✓ Many conference & symposia presentations
- ✓ Media and popular science coverage

Synergistic activities

By 2017: >\$4.1 million in additional support

- Montana EPSCoR RII funding, focused on climate and land-use change (\$14K+)
- NSF IGERT support
- NSF DDRI grants
- USFS Challenge grant
- Murdoch Foundation Partners in Science award Joint Fire Sciences grants
- Australian Res Council Discovery grants (\$500K)
- JFSP GRIN
- Camp Monaco award
- NSF grants for NZ, Patagonia, Rocky Mtns
- TESNAR grant with USGS (\$14.4K)
- USFS Fire Science Lab Cooperative Agreement
- Dept of Energy funding (\$8.5K)
- University grants (\$25K+)
- Student fellowships, awards & grants
- PEER grant to study fire management in Lebanon (\$19.8K)
- NASA grant (\$1.6 M)
- NSF REUs

Partnerships



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EDUCATION & OUTREACH

The Mentoring Ladder

Project goal: Mentor & train researchers for challenges in international collaborative science

At each level, participants oversaw and supported the activities of more junior members



The Internship Program

- Appropriate international research & NGO experiences
- Recruitment & Selection
- International preparation
- Monitoring
- Evaluation: Students & NGOs
- Follow-on support



Graduate Education & Training

- Overseas field work & lab experiences
- Interactive multi-institutional graduate seminar
- US & International graduate committees
- All-Hands PIRE meetings
- Professional meetings & workshops
- Teaching opportunities
- Mentoring undergraduate interns



Postdoc / Early-career Mentoring

- Senior mentorship
- Publication prominence
- Project management responsibilities
- Synergistic opportunities (Argentina, Lebanon, etc.)
- Professional networking
- Mentoring graduates & undergraduates
- Classroom experience



Career Advancement

- Undergraduate interns now in graduate programs
- Graduate students now in post-docs and NGOs
- Post-docs in faculty research & teaching positions and NGOs
- Ass't Profs gained tenure
- Senior faculty closer to retirement!

Outreach & Engagement

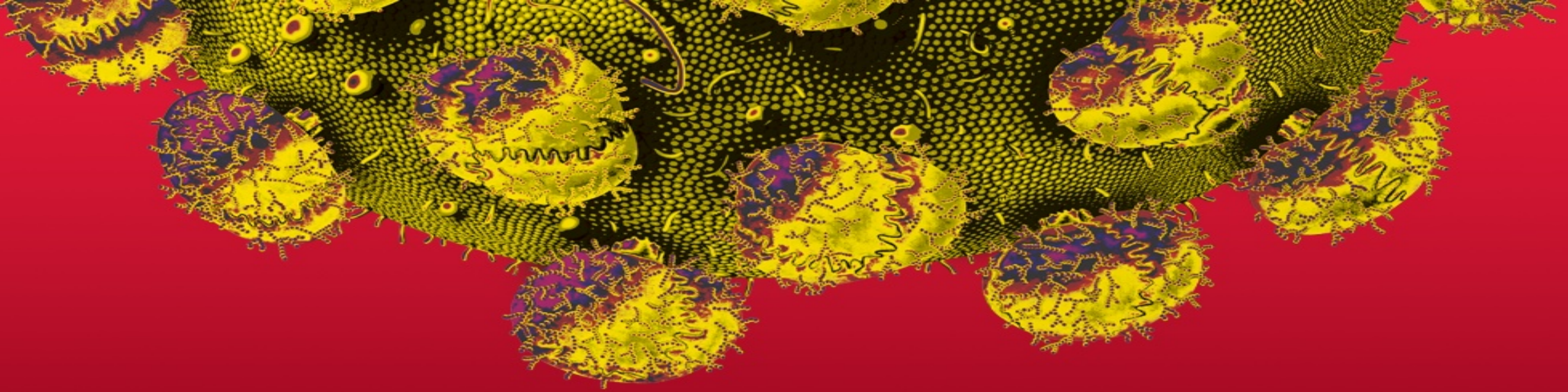
- www.wildfirepire.org
- Film, Podcasts, Blogs
- Online teaching modules
- Fire manager-scientist partnerships
- Tribal college partnerships
- Symposium & workshops
- Media coverage





WildFIRE PIRE

NSF Partnerships for International Research and Education



International Research Partnerships in Sub-Saharan Africa

Charles Wood, Ph.D.

Lewis Lehr/3M University Professor of Biological Sciences and Biochemistry



May 4, 2021

Zambia Program

2000 Vision

Respond to critical needs in Zambia to increase in-country capacity to 1) prevent, diagnose, and manage HIV-infected individuals who otherwise would not have the resources to seek treatment and 2) detect, treat, and manage HIV/AIDS-associated opportunistic infections and diseases.

Current Vision

Respond to evolving needs and leverage new partnerships to train Zambian biomedical researchers and cancer health care providers in cancer epidemiology, diagnostics, pathology and molecular genetics, and cancer genomics.

Program Partners

Original Partners

NIH Fogarty International Center, University of Alabama-Birmingham (U.S.), University of Miami (U.S.), University of Nebraska (U.S.), University Teaching Hospital (Zambia), University of Zambia School of Medicine (U.S.)

Growing List of Partners

Cancer Diseases Hospital (Zambia), CDC/PEPFAR, City of Hope National Medical Center (U.S.), Ocean Road Cancer Institute (Tanzania), NIH/Fogarty/NIMH/NINDS/NIDA Brain Disorder Program, NIH/National Center for Research Resource (NCRR)/NIGMS IDeA Center for Biomedical Research Excellence, NIH/NCI U54 Africa Cancer Consortium



Program Outcomes To Date

Enhanced collaborations between partner institutions

- *Memorandum of Agreement; bi-directional visits and exchanges; new research projects*

Enhanced research infrastructure

- *Research clinic established at UTH in 2002 and expanded in 2005 to support evolving needs of returning trainees*
- *Immunohistochemistry laboratory in pathology*
- *Staffed by Fogarty trainees– nurses, data team, medical personnel, many trained through the Fogarty program*

Capacity building

- *56 fellows trained in the U.S.; many more health professionals trained in-country through attachments and in-country workshops*

Technology transfer

New partnerships

- *Collaborated with CDC/PEPFAR to establish a research and reference laboratory for infant diagnosis, drug resistance tests and a reference library for the Center of Excellence in Pediatric and Family HIV Care*
- *Ocean Road Cancer Institute in Tanzania*

Long-term sustainability

- *Pediatric Center of Excellence in Pediatric and Family HIV Care led by local partner*
- *Developing umbrella research program led by local partners*
- *Developing next generation of partners via the Emerging Global Leader Program*





Tanzania Program

Vision

A collaborative international research and training effort between the U.S. and Tanzania focused on 1) acquiring a better understanding of the infection and pathogenesis of KSHV and HPV and 2) developing intervention strategies based on this acquired knowledge to limit two of the most common AIDS-associated cancers in Tanzania.

Partners

NIH/NCI U54 Africa Cancer Consortium, Ocean Road Cancer Institute (Tanzania), University of Nebraska (U.S.)



Program Outcomes To Date

- Established research team and training of personnel
- Established on site laboratory support for research projects
- Enhanced on site pathology capacity
- Ongoing recruitment and analysis of collected specimens
- Developing new research directions
- Ongoing training in the U.S.
- Establishing inter-consortia collaborations



Acknowledgements





Audience Questions