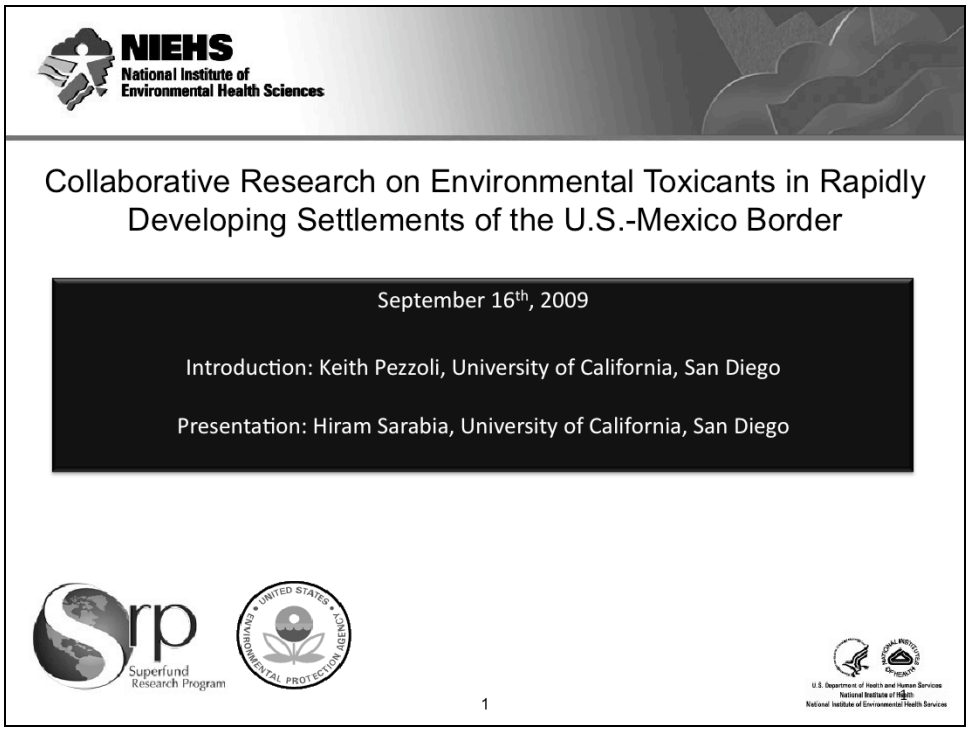
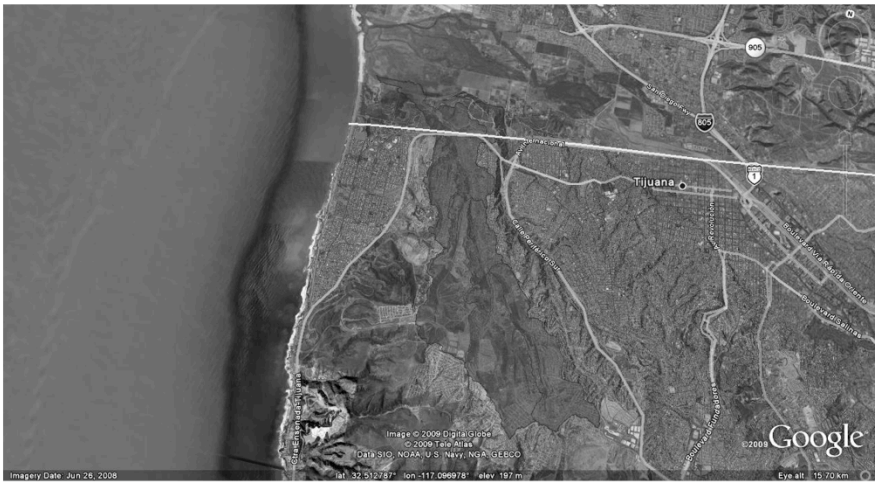

NIEHS
National Institute of Environmental Health Sciences
Collaborative Research on Environmental Toxicants in Rapidly Developing Settlements of the U.S.-Mexico Border
September 16th, 2009
Introduction: Keith Pezzoli, University of California, San Diego
Presentation: Hiram Sarabia, University of California, San Diego
Srp
Superfund Research Program
1

Collaborative Research on Environmental Toxicants in Rapidly Developing Settlements on the U.S.-Mexico Border



Keith Pezzoli, Hiram Sarabia, Camille Konopnicki, Robert Tukey
UCSD Superfund Research Program

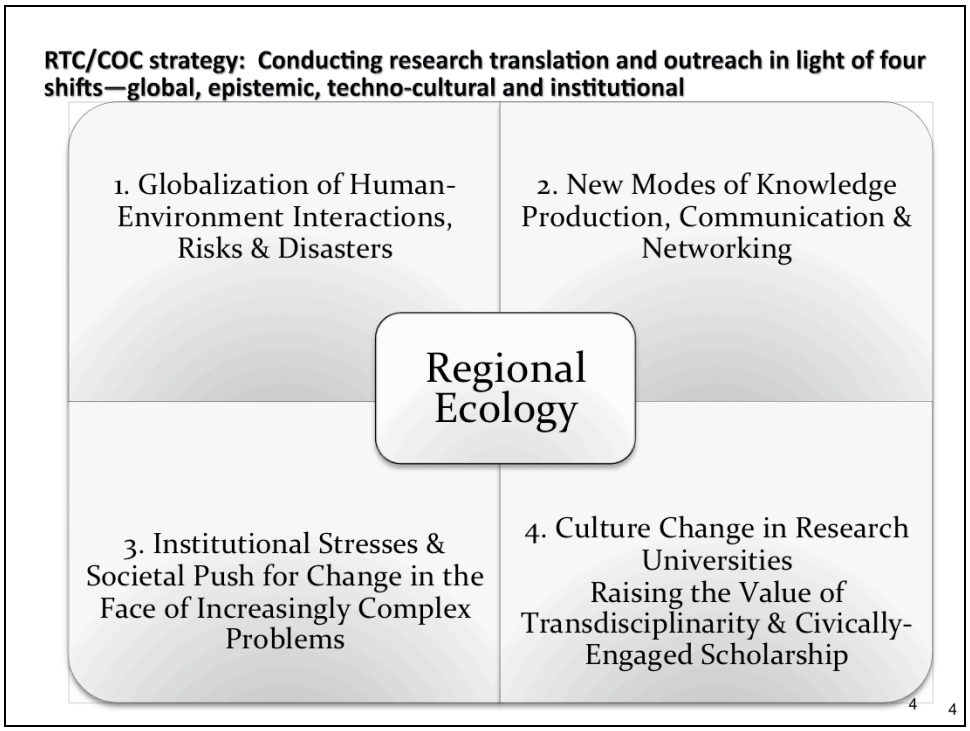
2

This project aims to improve environmental public health in the San Diego-Tijuana city-region. The objective is twofold:

•Develop new watershed-based strategies/models that can help the National Institute of Environmental Health Sciences (NIEHS) address Global Environmental Health (GEH), and

•Share the science and technology contributions of UCSD's Superfund Basic Research Program (SBRP) with urban-regional planning scholars, educators and professionals who are struggling to better understand how problems of the built environment, land use and pollution impact environmental public health.

3

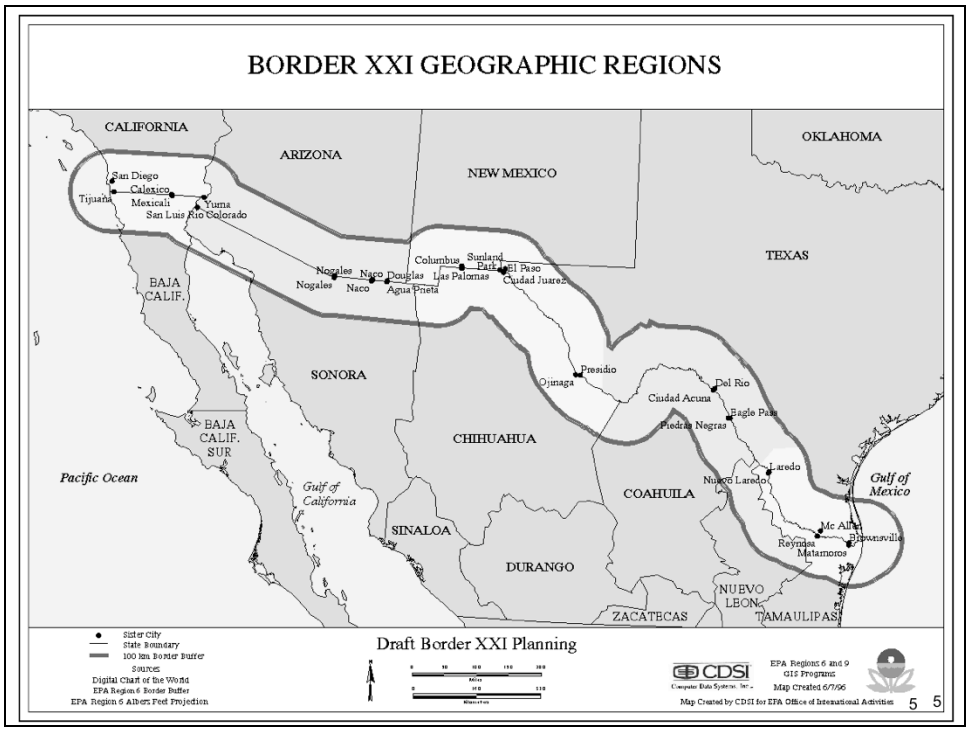


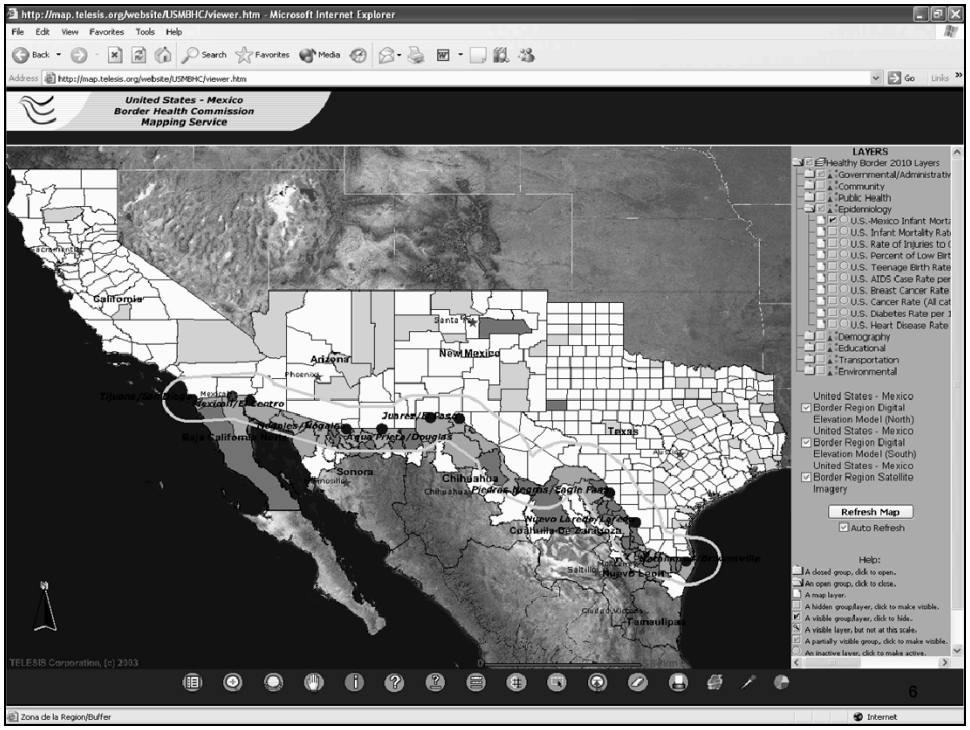
Kunstler hypothesis: <u>The long emergency:</u>
We are floating on a sea of fossil fuels—the low hanging fruit is disappearing, brace yourself for "the long emergency.

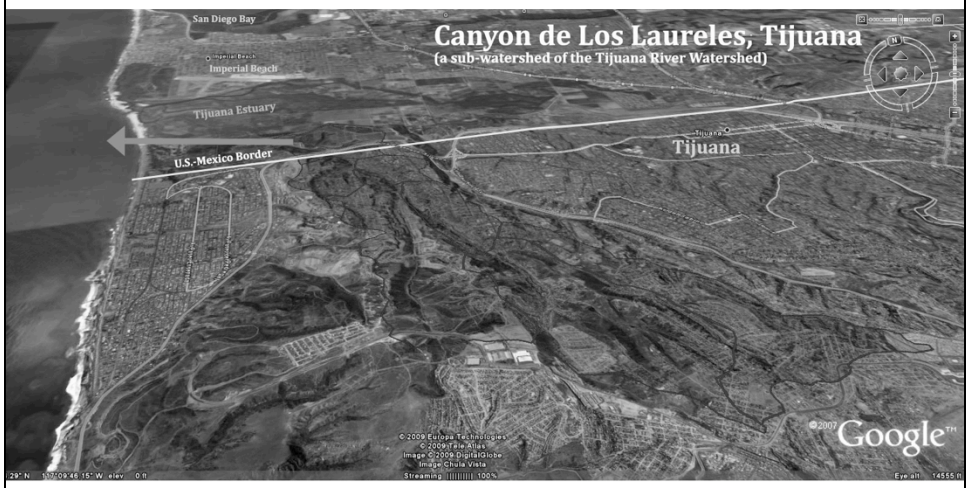
"Institutional shatter and reconstitution –critical regional ecology and the role of research universities
Take as axiomatic that current modes of production, consumption, distribution are not sustainable; and that institutional failure will be pervasive and painful. Synergistic disasters in a world risk society.
Whether you believe in peak oil or not –the second law of thermodynamics comes in to play here, we are exploiting not just the entropic juice of embodied sunlight sequestered in fossil fuels, but also the embodied energy in the structured order of biodiversity, ecosystems like wetlands, good soil, forests, fisheries, etc.

<u>Gardening a Turbulent Earth</u>
Joining ecological regionalism (drawing upon while going beyond the classics: Howard, Geddes, Mumford) with critical global mindedness (megatrends socio-ecological, institutional, cultural). We need to be proactively defensive ---- reconstitute the wetlands, tear up the concrete liners, safeguard local resources essential for regional food production, water supply, foster knowhow for local livelihood opportunities (cottage industry); episteme, techne, phronesis, protect our cultural diversity, etc.

Socialization of collections (democracy)
Federation of distributed knowledge
Regional Workbench Consortia and Global Planning Grids
Metaphor: low lying coastal city –going about our business, working hard (and harder), consuming, tending to our families and to certain extent larger communities ---but the tsunami is on its way, the alarm has begun to scream, but what recourse do we have, what are the escapes? There are no roadways out to higher ground. Reactionary….But what we get is a clamor for drilling in Alaska, a global police station in Iraq, more prisons.


BORDER XXI GEOGRAPHIC REGIONS
CALIFORNIA
ARIZONA
NEW MEXICO
OKLAHOMA
TEXAS
San Diego
Calexico
Tijuana
Mexicali
Yuma
San Luis Rio Colorado
Nogales
Naco
Douglas
Agua Prieta
Columbus
Sunland Park
El Paso
Las Palomas
Ciudad Juarez
BAJA CALIF.
SONORA
Presidio
Ojinaga
Del Rio
Ciudad Acuna
Eagle Pass
Piedras Negras
BAJA CALIF. SUR
CHIHUAHUA
Laredo
Nuevo Laredo
Pacific Ocean
Gulf of California
COAHUILA
Gulf of Mexico
SINALOA
Mc Allen
Brownsville
Reynosa
Matamoros
DURANGO
NUEVO LEON
ZACATECAS
TAMAULIPAS
Sister City
State Boundary
100 km Border Buffer
Sources
Digital Chart of the World
EPA Region 6 Border Buffer
EPA Region 6 Albers Conf Projection
Draft Border XXI Planning
CDSI
Computer Data Systems, Inc.
EPA Regions 6 and 9
GIS Programs
Map Created 6/7/96
Map Created by CDSI for EPA Office of International Activities
5 5


http://map.telesis.org/website/USMBHC/viewer.htm - Microsoft Internet Explorer
United States - Mexico
Border Health Commission
Mapping Service
LAYERS
Healthy Border 2010 Layers
Governmental/Administrativ
Community
Public Health
Epidemiology
U.S.-Mexico Infant Mort
U.S. Infant Mortality Rat
U.S. Rate of Injuries to
U.S. Percent of Low Birt
U.S. Teenage Birth Rate
U.S. AIDS Case Rate per
U.S. Breast Cancer Rate
U.S. Cancer Rate (All ca
U.S. Diabetes Rate per
U.S. Heart Disease Rate
Demography
Educational
Transportation
Environmental
United States - Mexico
Border Region Digital
Elevation Model (North)
United States - Mexico
Border Region Digital
Elevation Model (South)
United States - Mexico
Border Region Satellite
Imagery
Refresh Map
Auto Refresh
Help:
A closed group, click to open.
An open group, click to close.
A map layer.
A hidden group/layer, click to make visible.
A visible group/layer, click to hide.
A visible layer, but not at this scale.
A partially visible group, click to make visible.
An inactive layer, click to make active.
California
Arizona
New Mexico
Texas
Sonora
Chihuahua
Tamaulipas
TELESIS Corporation, (c) 2003
Zona de la Region/Buffer
Internet


San Diego Bay
Canyon de Los Laureles, Tijuana
(a sub-watershed of the Tijuana River Watershed)
Imperial Beach
Tijuana Estuary
U.S.-Mexico Border
Tijuana
© 2009 Europa Technologies
© 2009 Tele Atlas
Image © 2009 DigitalGlobe
Image Chula Vista
Streaming 100%
©2007 Google™

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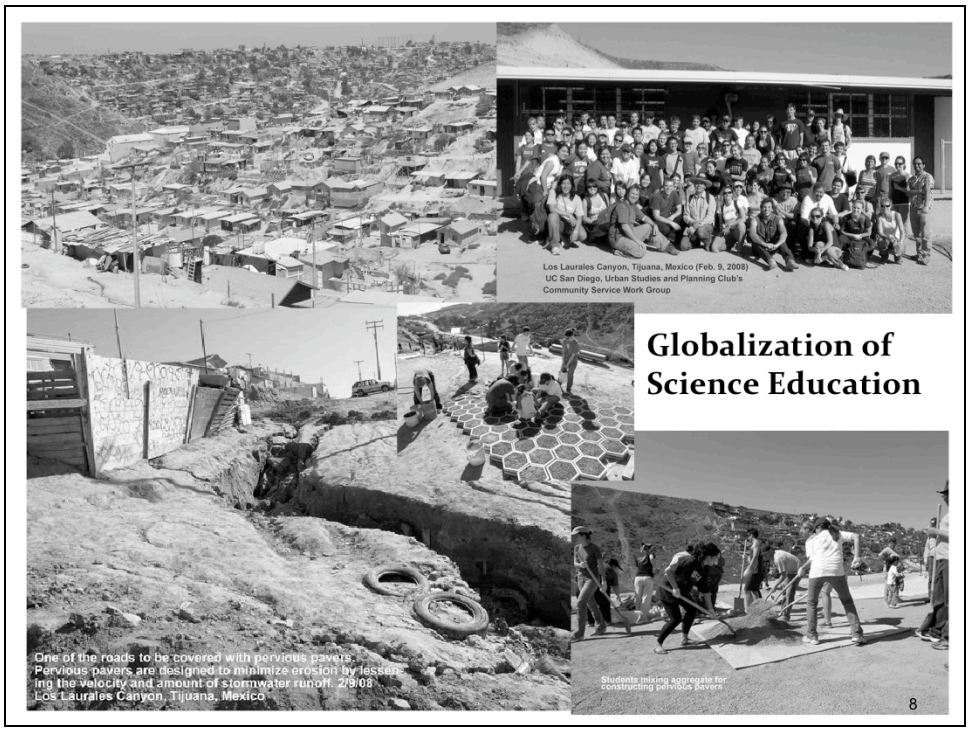


This slide merely reinforces the need, and benefits, of a global perspective in science education. We are fortunate in San Diego to be so close to Mexico. It creates a living laboratory for applications of new science in theory and practice.

UCOP article

UC San Diego students pave way to cleaner water

News Report from UC President : Your University Online, March 2008

http://www.universityofcalifornia.edu/advocacy/your_university_03_2008/story7.html

The 90 UC San Diego students hard at work in a canyon neighborhood in Tijuana on a Saturday afternoon are learning about environmental sustainability, municipal infrastructure and border economics one street paver at a time.

The UC San Diego Urban Studies and Planning Club is part of a binational pilot project to reduce water pollution by applying porous or "pervious" surfacing technology to dirt roads. The project focuses on the Tijuana River Watershed, which stretches across the U.S.-Mexico border, and its Los Laureles Canyon where 80,000 Tijuanans live in makeshift homes with no streets, sewers or power.

With support from both the U.S. and Mexican governments, the students are helping residents build and install 35,000 pervious street pavers to absorb wastewater and prevent runoff into the Tijuana River Estuary and the adjoining San Diego Bay.

"There is one thing you might keep in mind," Oscar Romo told the students at a midweek orientation. "We're doing this project in Mexico in part because we're trying to save wetlands in the United States."

An international border doesn't stop pollution, and it doesn't stop poverty. Romo, a pioneer in transborder environmental protection efforts, works at the Tijuana River National Estuarine Research Reserve and teaches at UC San Diego. He has spent decades trying to alert the public that runoff from unsustainable development creates hazardous erosion, pollutes dwindling water supplies and spreads disease. Border demographics and economics have given Romo's campaign a new urgency. With a population that has increased sixfold from 235,000 in 1964 to more than 1.5 million today, Tijuana has outpaced Las Vegas as North America's fastest-growing city. Those numbers have spiked over the past decade since the North American Free Trade Agreement ushered in border manufacturing plants, called *maquiladoras*, that attract low-wage workers from throughout Latin America.

The Los Laureles neighborhood of Colonia de San Bernardo has sprung up as a settlement for *maquila* workers and their families. Homes are thrown together from scrap plywood, used cinder blocks and even discarded garage doors, much of it from San Diego. As student club leader Adam Krohn explained on the bus ride to the project site, "The people of the *colonia* can't afford building materials, so they've become very good at using things that we throw out."

Krohn reminded the students that the *maquilas* are thriving (and driving the population surge that strains the environment) because they produce electronic goods that are wildly popular with young U.S. consumers.

"This isn't meant as a guilt trip on you guys," he said. "I just want you to recognize while we're here that everything is interconnected. An international border doesn't stop pollution, and it doesn't stop poverty."

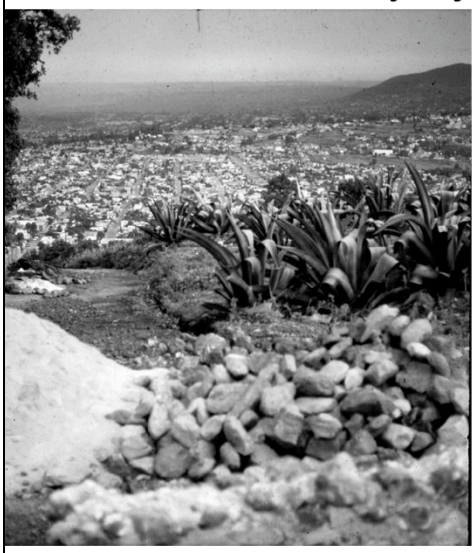
The interdisciplinary value of the Tijuana project extends to cross-cultural studies. During the orientation, a student asked if she could bring bags of used clothing to donate to the impoverished canyon residents. "Thank you, that is a kind offer," Romo said gently. "But I would advise against it. The people of the *colonia* are very proud. They appreciate our help with the pavers, but any kind of gift would be an affront to their dignity. The kids might like it, but the parents would not."

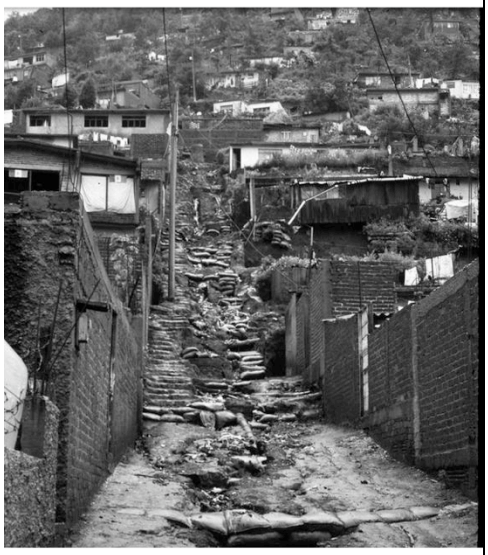
Colonia residents have set a goal of laying 70,000 pavers to cover a half-mile stretch of the main road. The foot-wide hexagonal pavers are made of gravel, cement and water poured into wooden frames and allowed to harden. Once in place, they drain wastewater into the ground where naturally occurring bacteria remove harmful effluent. If the pilot project succeeds, its binational backers, which include the city of Tijuana and the California Coastal Conservancy, will look to replicate the low-cost technology throughout the region.

For the UC San Diego students, paver construction is a hands-on lesson about how good science can produce good public policy through local empowerment. "This is a wonderful example of civically engaged service-learning with a strong research component of deploying new biomolecular tools in a community setting," said Keith Pezzoli, a UC San Diego professor in the Urban Studies and Planning Program who also does research for UC San Diego's Superfund Basic Research Program.

The ultimate payoff of the students' Tijuana project may occur back home in San Diego. Krohn, whose senior thesis is on best practices in watershed management, believes that pervious paving technology could catch on in the United States, where construction of roads, sidewalks, parking lots and driveways has typically relied on impervious surfacing. "The fact that it can be done here in Tijuana on an informal basis gives students a one-of-a-kind opportunity to see how sustainability and planning theory can be directly applied to the world around them," Krohn said.

Mexico City, Ajusco Medio





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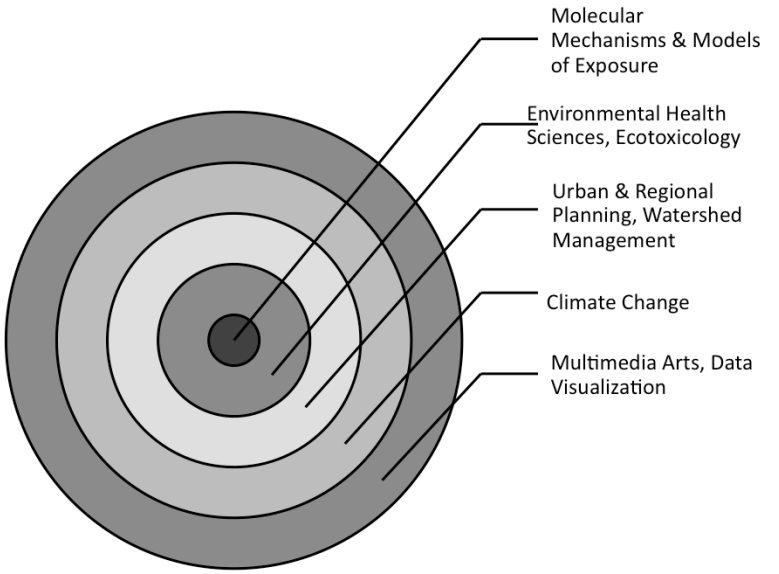
Nested approach to Research Translation



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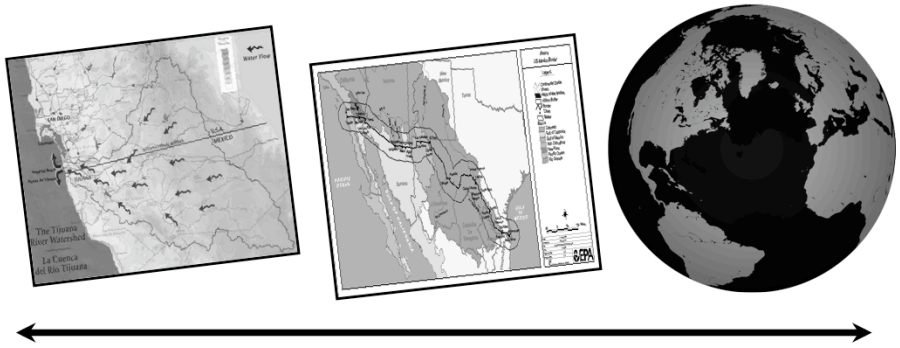
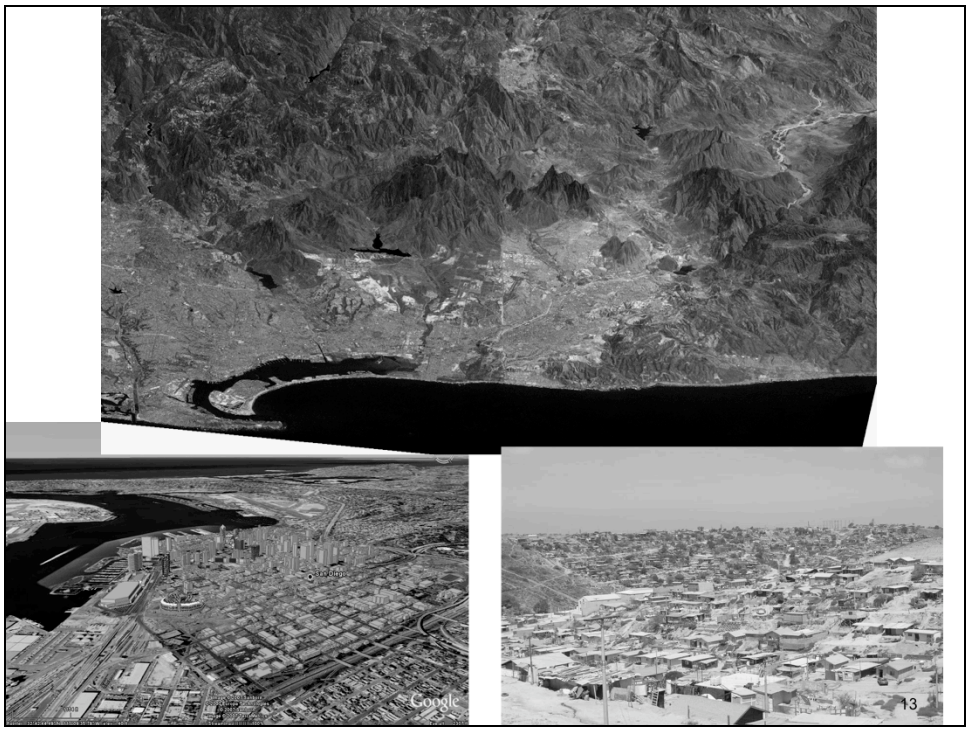

Water Flow
SAN DIEGO
MEXICO
The Tijuana River Watershed
La Cuenca del Río Tijuana

12


Google
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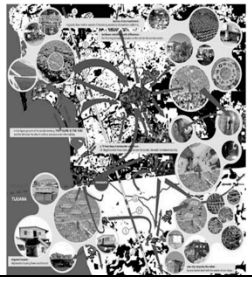

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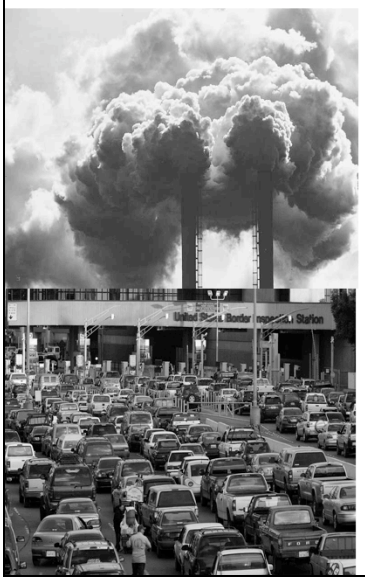

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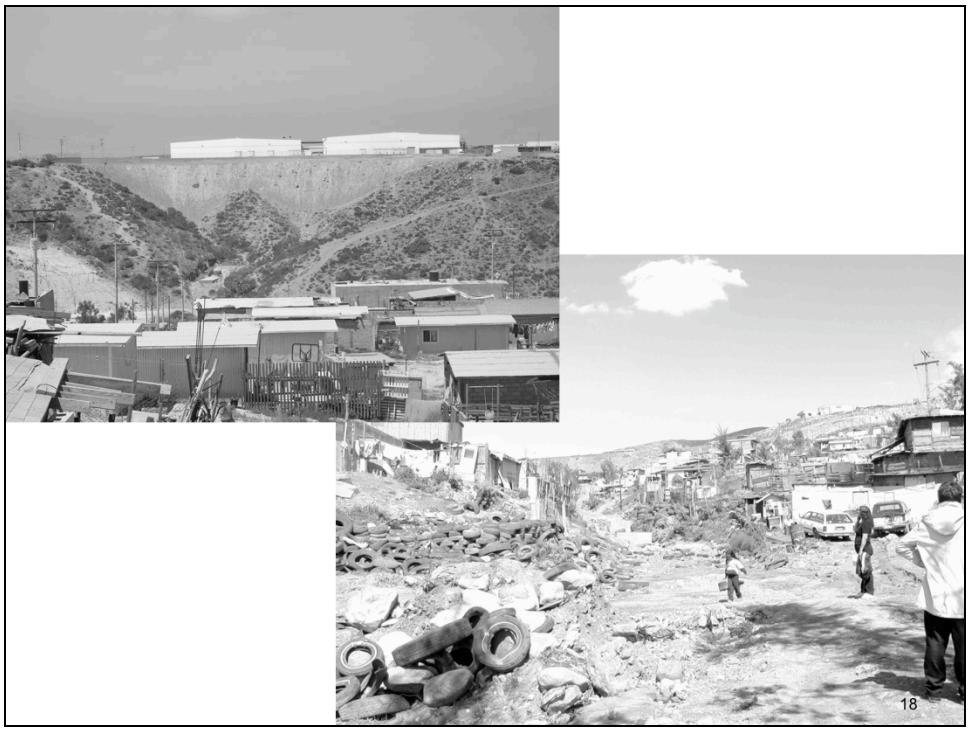
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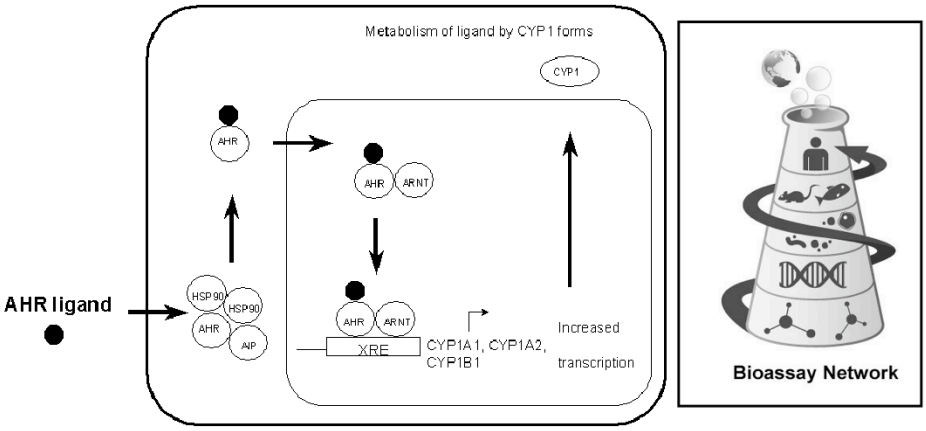
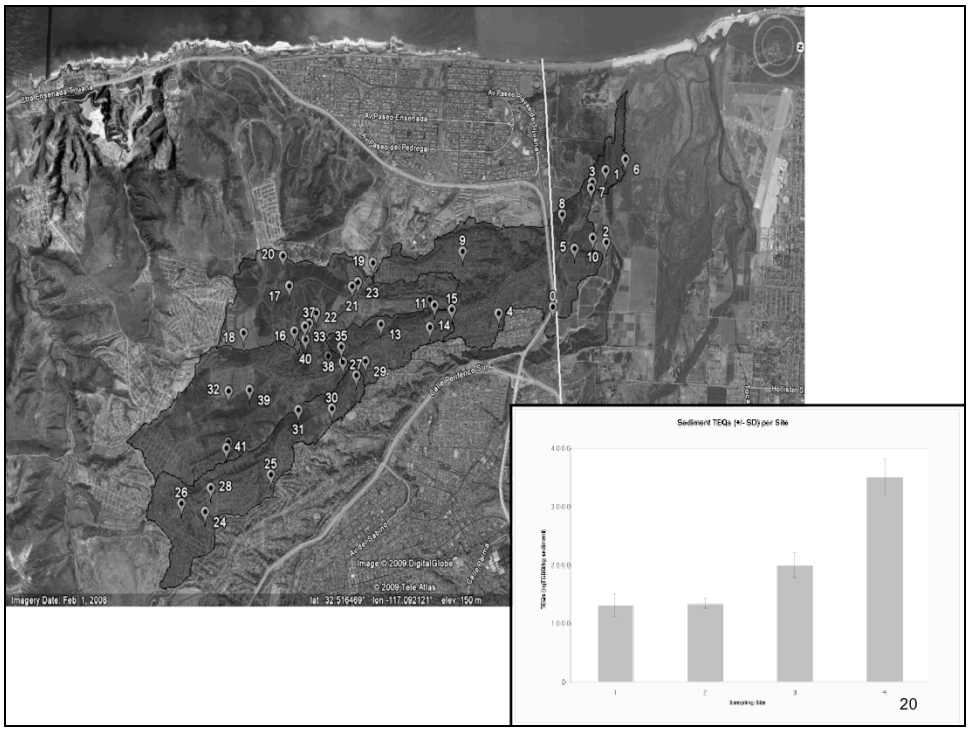
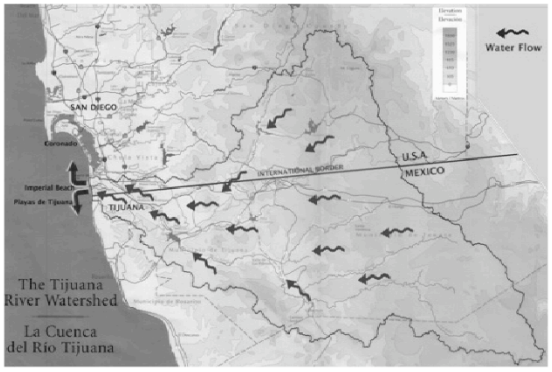

Metabolism of ligand by CYP1 forms
CYP1
AHR
AHR
ARNT
AHR ligand
HSP90
HSP90
AHR
AIP
AHR
ARNT
XRE
CYP1A1, CYP1A2,
CYP1B1
Increased
transcription
Bioassay Network

19

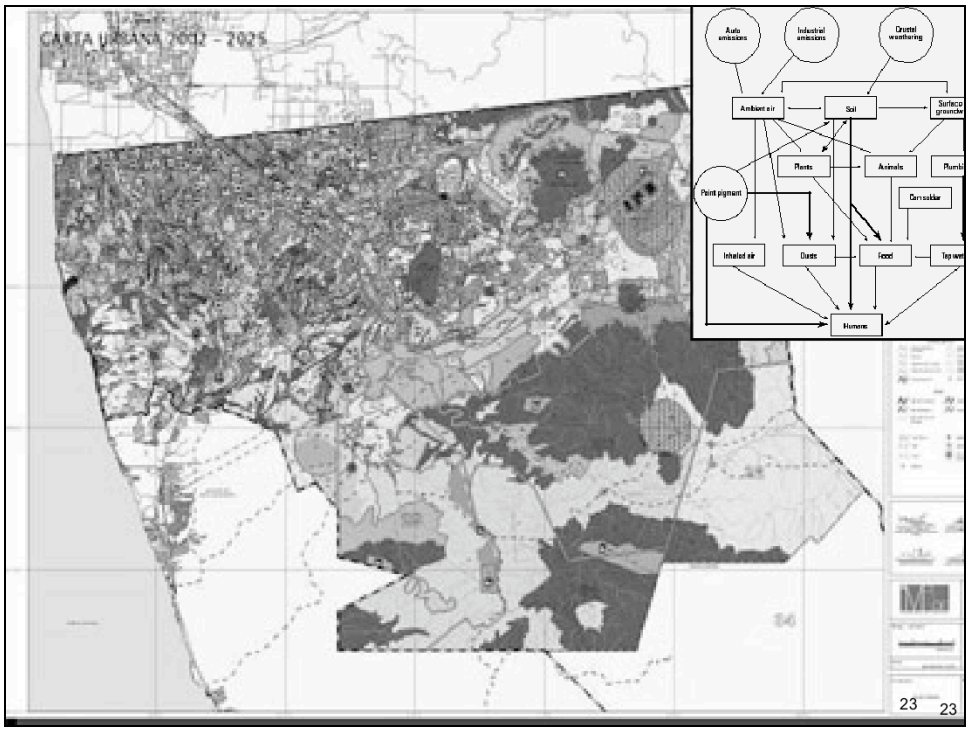

Av Paseo Ensenada
Paseo del Pedregal
Imagery Date: Feb 1, 2008
lat 32.516469° lon -117.092121° elev 150 m
Image © 2009 DigitalGlobe
© 2009 Tele Atlas
Sediment TEQs (+/- SD) per Site
4000
3000
2000
1000
0
1
2
3
4

Species	Metales y Derivados Site	School Yard LC Site
Acid Ext As	780 ug/g	4 ug/g
Acid Ext Pb	27,000 ug/g	34 ug/g
Acid Ext Cd	48 ug/g	<0.1 ug/g



21


Calle Palma
Calle Alcor
Av del Sabino
Calle Periferico Sur
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
© 2009 Tele Atlas
Image © 2009 DigitalGlobe
©2009 Google
Imagery Dates: Feb 1, 2008 - Jun 26, 2008
lat 32.515313° lon -117.089506° elev 145 m
Eye alt 10.53 km
22


CARTA URBANA 2012 - 2025
Auto emissions
Industrial emissions
Crustal weathering
Ambient air
Soil
Surface groundw
Plants
Animals
Paint pigment
Inhaled air
Dusts
Food
Humans
23

24


SBRP and UCSD Office of Research Affairs visit the Planning Institute of Tijuana (IMPLAN)
November 11, 2008


EPA Visits SBRP (Liechtag Build.)
January 29, 2009


25

Acknowledgements

- Mike Gill USEPA /Beth Anderson NIEHS / Monica Ramirez UA SRP
- NIEHS SRP
  - **P42 ES010337**
  - **3 P42 ES010337-09S1**
- Oscar Romo, NOAA/TRNERR
- City of Tijuana IMPLAN
- Shannon Bradley- UCSD TV
- Ilya Zaslavsky SDSC
- Alejandro Hinojosa & Meritxell Riquelme CICESE)
- UCSD SIO – Cayan & Dittinger Lab
- Consejo de Cuenca del Canon de los Laureles

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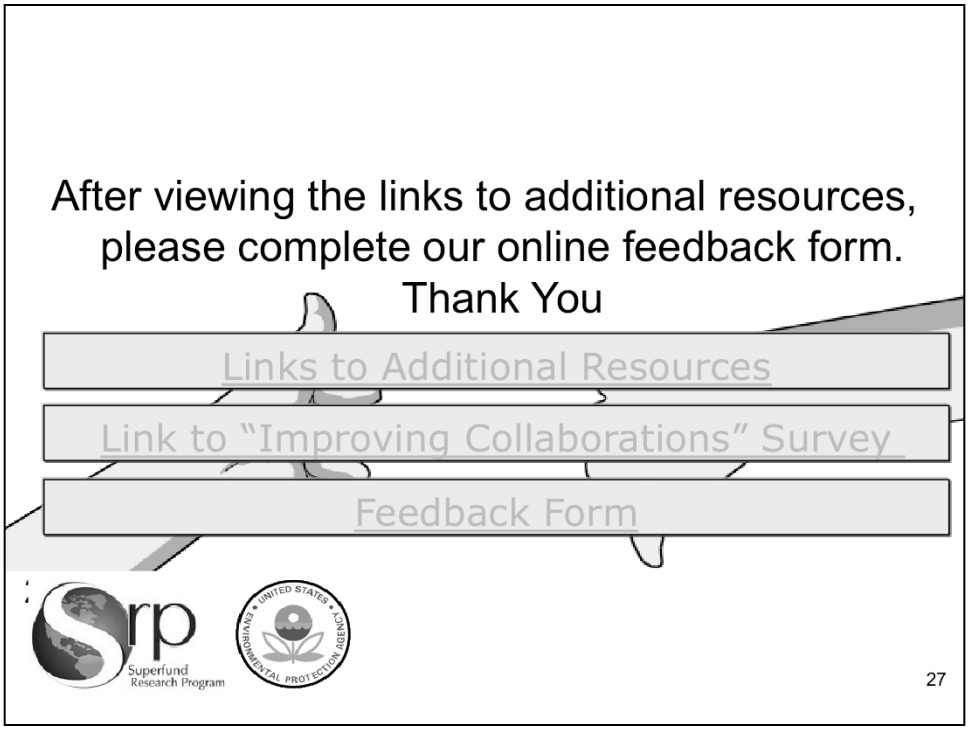
After viewing the links to additional resources, please complete our online feedback form.
Thank You
Links to Additional Resources
Link to "Improving Collaborations" Survey
Feedback Form
Srp
Superfund Research Program
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
27