

Science for Human Rights

Methods for
Security and Humanitarian Aid
(a work in progress)

Based on work by Scott Edwards, SHR Director, AIUSA



**AMNESTY
INTERNATIONAL**



www.amnestyusa.org/science



Topics

Overview

Research and Information Gathering

Computational Tools

Data Visualization

Education and Training

Economic, Social, and Cultural rights (ESCR)

Science for Human Rights Is Not New

- Analysis and studies of environmental hazards
 - Lead
 - Air pollution
 - Pesticides used by farm labor
- Vaccines to disadvantaged regions
- Medical Forensics
 - Argentina, Chile, ...

Human Right to the Benefits of Science

- The human right to the benefits of science was first internationally recognized in the 1948 United Nations Universal Declaration of Human Rights (UDHR)
- More recent tenets of the right include:
 - Equitable access to the benefits of scientific progress, with particular focus on vulnerable and marginalized groups
 - Investing in R&D and creating incentives for innovation to address suffering of these groups
 - Freedom of scientists to engage in scientific inquiry, while also conducting their work responsibly
 - Fostering international cooperation in science

Summary of AAAS Statement on Right to Science

- Adopted 4/16/2010
- AAAS will:
 - Highlight the importance of discussions concerning the human right to benefit from science
 - Engage the domestic and global scientific communities in defining the right, and determining its application to a diverse range of scientific disciplines and concerns
 - Coordinate the efforts of the AAAS science and human rights coalition to pursue strategies for integrating this right into the work of coalition members
 - Building on these activities, engage the US government and other key actors in dialogue on the right to benefit from science, and its implications for policies and programs

Science-Based Humanitarian Methods

- **Research and Information Gathering**
 - Satellite Imaging
 - Crowd Sourcing – using modern telecommunications
 - Participatory geographic information systems (GIS)
 - Must be careful to protect sources
- **Computational Tools**
 - Artificial Intelligence
 - Searching news reports
 - Language recognition
 - Automated Image Analysis
 - Models of Forced Migration
- **Data Visualization**
 - Geospatial mapping
- **Training**
- **Economic, Social, and Cultural rights (ESCR)**
 - Medical technology

Technology: Power to the People

- Cell phones are everywhere
 - Even in poor, developing regions
 - Especially useful with cameras
 - Exposing possible government murder in china with photos from phones
 - Government cover up tried to censor photographs, but couldn't stop the Internet distribution
 - And video
 - SF BART shooting was video recorded on a cell phone
 - For many poor people, cell phones are their livelihoods
 - Allow efficient travel for business deals (fuel costs oppressive)
 - Citizen reporting
 - Buying a sim card normally requires a name and ID, but many stores don't check them. This allows anonymous phone use.
- Solar cells to power the above (e.g. Africa)
- Cell is the only Internet access available at many homes

21st Century Human Rights Monitoring, Advocacy, and Conflict Avoidance

- Since 2008, AIUSA has been working with the wider AI movement to modernize the tools and techniques of the human rights advocacy trade.
 - Satellite imaging
 - Computational analysis tools
 - Artificial intelligence
 - Image feature extraction (huts, fires, buildings, ...)
 - Migration models
 - Data Visualization
 - Geospatial mapping
 - User selected data filtering/combining
 - “Crowd sourcing”

A world map with a light blue background and green and yellow landmasses, serving as a background for the text.

Research and Information Gathering

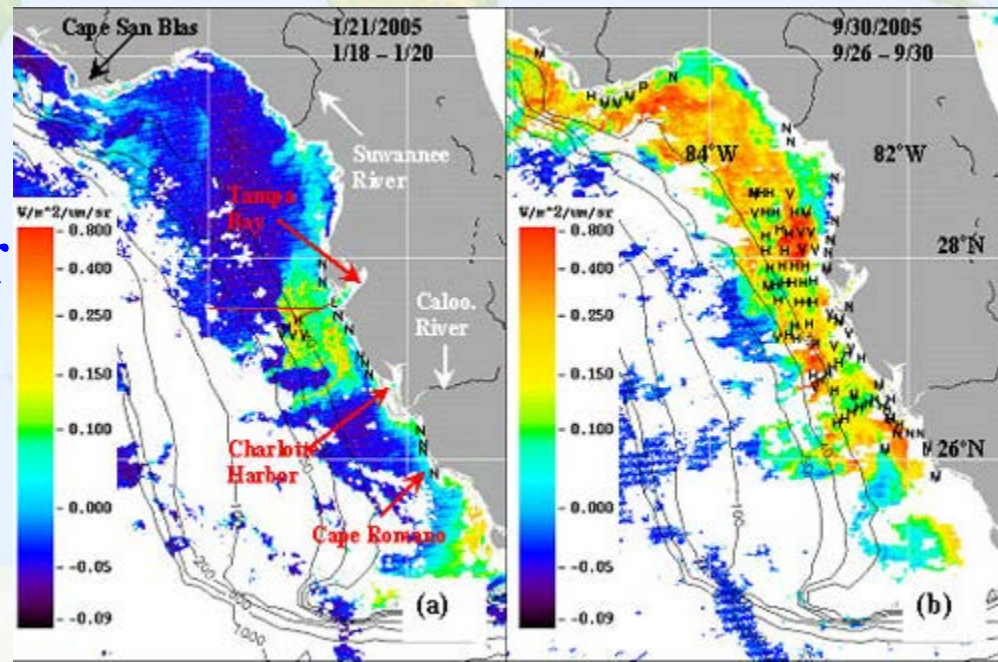
Satellite Imaging

Crowd Sourcing

Alternative Data Streams

Satellite Imaging: More Than Just Pictures

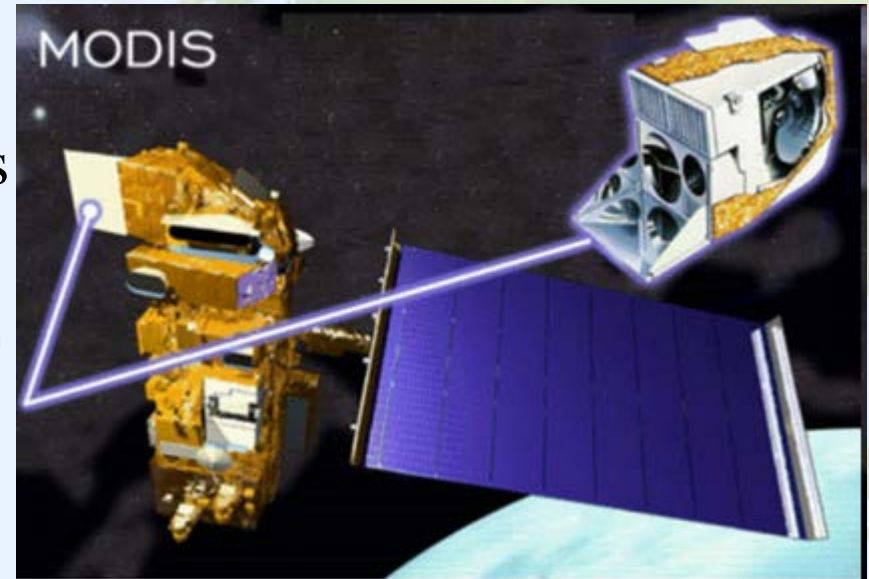
- Visible image
 - High resolution ($\sim 0.5 - 2$ m)
- Multi-spectral
 - Lower resolution (~ 20 m)
 - Fire sensing requires only $\sim 10-50$ m resolution
- “Remote sensing” using cloud and canopy piercing radar



The Satellites

- **Mostly commercial**

- Military doesn't share images and data
- Privately owned
- Sell images for profit
- ~\$100M investment
- Expensive to operate



- **Lifetime of years, with planned replacement**
- **Some control over its course**
 - Requesting specific locations costs even more
- **Surface coverage is variable**

Eyes on Darfur

www.eyesondarfur.org/

- In 2006, Amnesty International USA (AIUSA), and the American Association for the Advancement of Science (AAAS) used satellites to record irrefutable evidence of destruction in Darfur
 - High-resolution satellite imagery provides unimpeachable evidence of the atrocities being committed in Darfur
 - Enables action by policy makers, international courts, and private citizens
- Created the Eyes on Darfur project
 - Broke new ground in protecting human rights by allowing people around the world to literally “watch over” Sudan
 - Focus to protect twelve intact, but highly vulnerable, villages
 - Only 2 were destroyed: generally considered a success

Crowd Sourcing: Amplifying Voices

- 1000 anecdotes is worth a solid piece of evidence
 - Humans coding news stories about perpetrators, victims, timing, and methods
 - E.g., [Eyes on Pakistan](#)
 - 1000 people predict conflict better than computer models
 - Statistical aggregation of thousands of human stories is more accurate than computer models in predicting conflict
- Cell phones are great
 - SMS and cameras are everywhere, even in poor countries
 - Weapons of mass documentation
 - Encryption: Blackberry and Saudi Arabia
- GPS locating
- Examples
 - Finding secret prisons in Eritrea
 - Feeding crowd-sourced information in real time to women's shelters

Crowd Sourcing Tools

- **Must be careful**

- Access codes for authenticity
- Verification: protect against manipulation
- Can sometimes inflame further violence

- **Ushahidi**

- Uses secret codes: must be set up ahead of time
- Hides information from perpetrators: protects sources

- **Martus**

- Encrypts longer narratives

- **Benetech: non-profit development for human rights**

- **AIUSA working to merge data sets**

- Combining real-time crowd-sourcing with data visualization

Ushahidi (and similar) Systems: Amplifying Voices

Democratic Republic of Congo
Tracking the Eastern Congo Conflict

HOME REPORTS SUBMIT AN INCIDENT GET ALERTS CONTACT US HOW TO HELP ABOUT US

FILTERS → REPORTS NEWS PICTURES VIDEO ALL VIEWS → CLUSTERS TIME

From: Oct 2009 To: Dec 2009

2010 Europa Technologies - Terms of Use

MEDIA FILTER REPORTS NEWS PICTURES VIDEO ALL

From: Jan 2008 To: Dec 2009

HOW TO REPORT

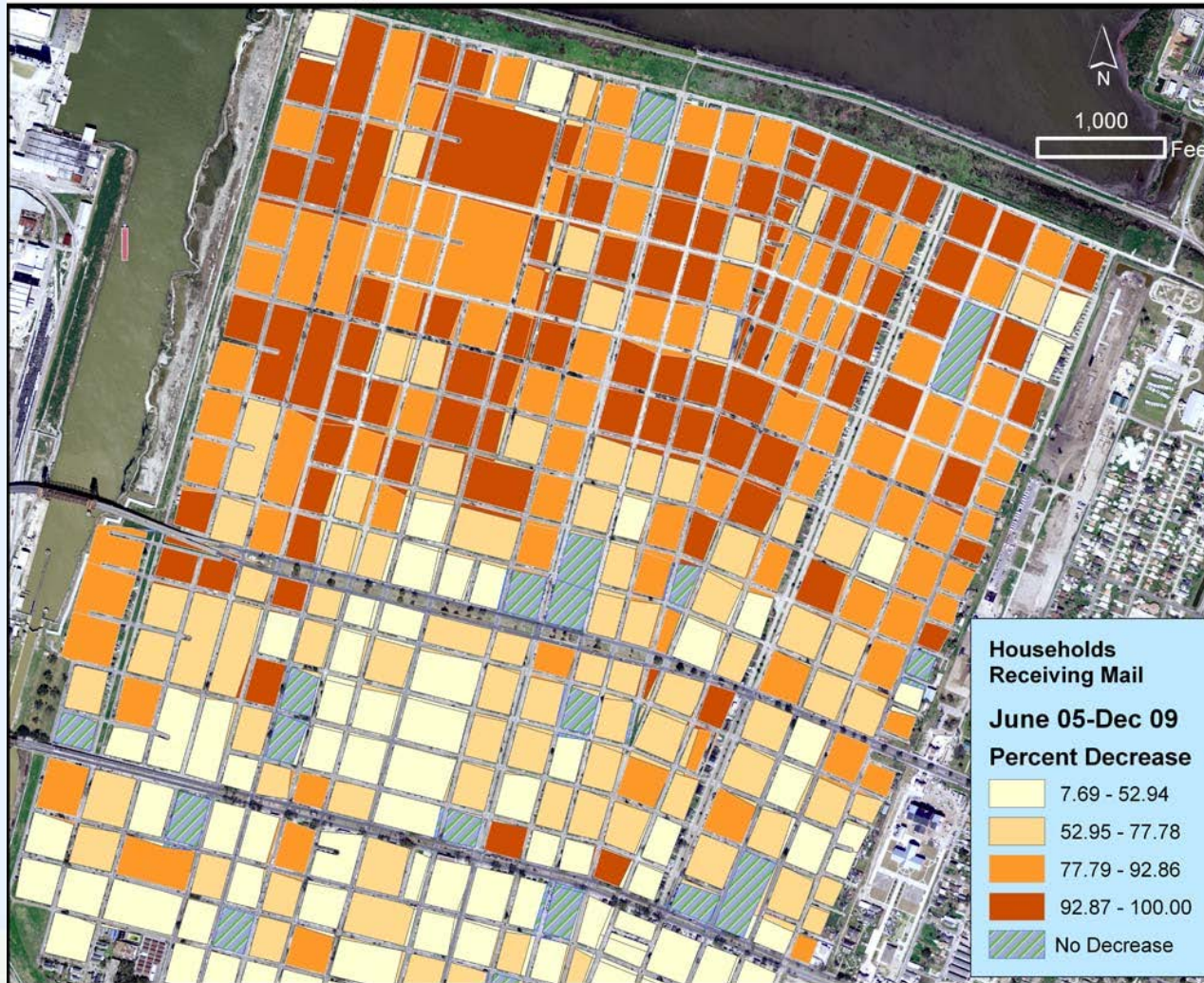
1. By sending a message to 243992592111
2. By filling a form at the website

In places such as Haiti or DRC, individuals can securely report isolated events

Groups with no servers can still set up their own mapping center.

Alternative Data Streams (Data Mining)

% Change in the Number of Households per Block Actively Receiving Mail Between June 2005 and December 2009



- Lagging Reconstruction in the New Orleans lower 9th Ward, as indicated by Postal Delivery records

A world map with a light blue background and green and yellow landmasses, serving as a background for the text.

Computational Analysis Tools

Artificial intelligence

Conflict models

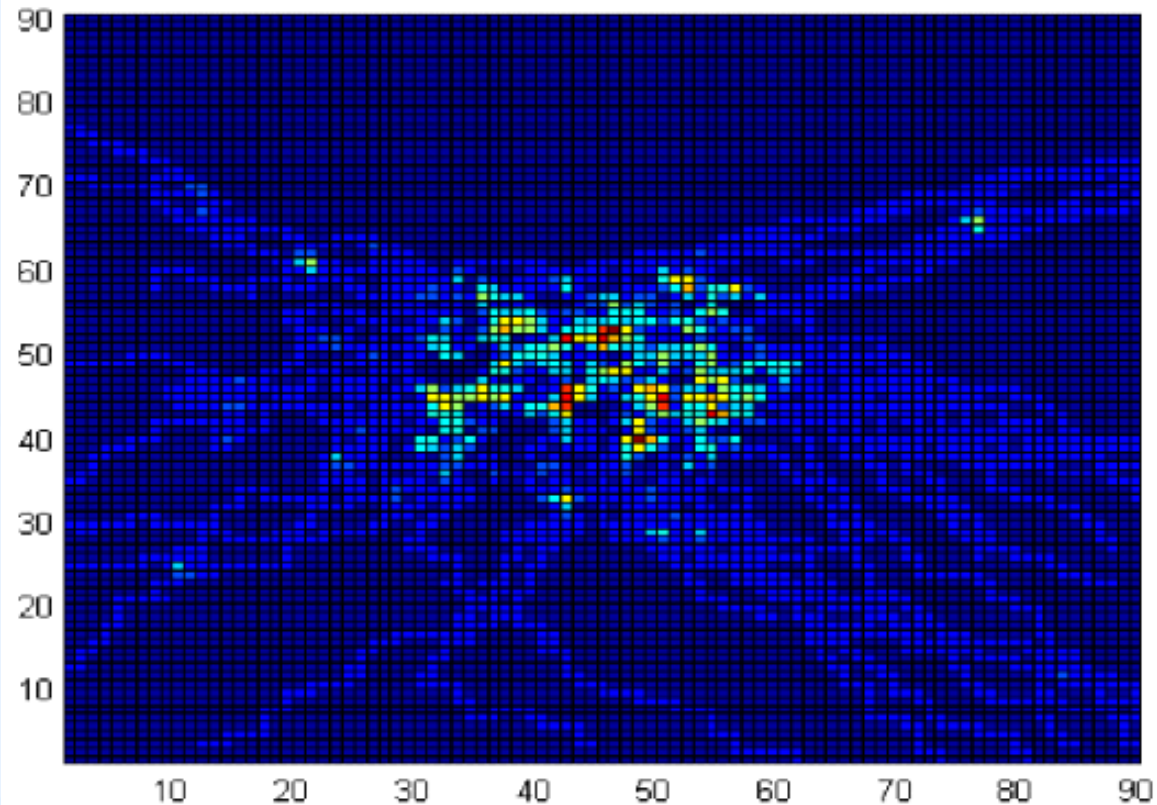
Migration models

Automated Image Recognition

- Only crude algorithms available, as yet
 - Computationally expensive
- Computer selects candidates
 - Requires human intervention on each image for confirmation
- Miss rate not well known

Crisis Early Warning and Risk Analysis

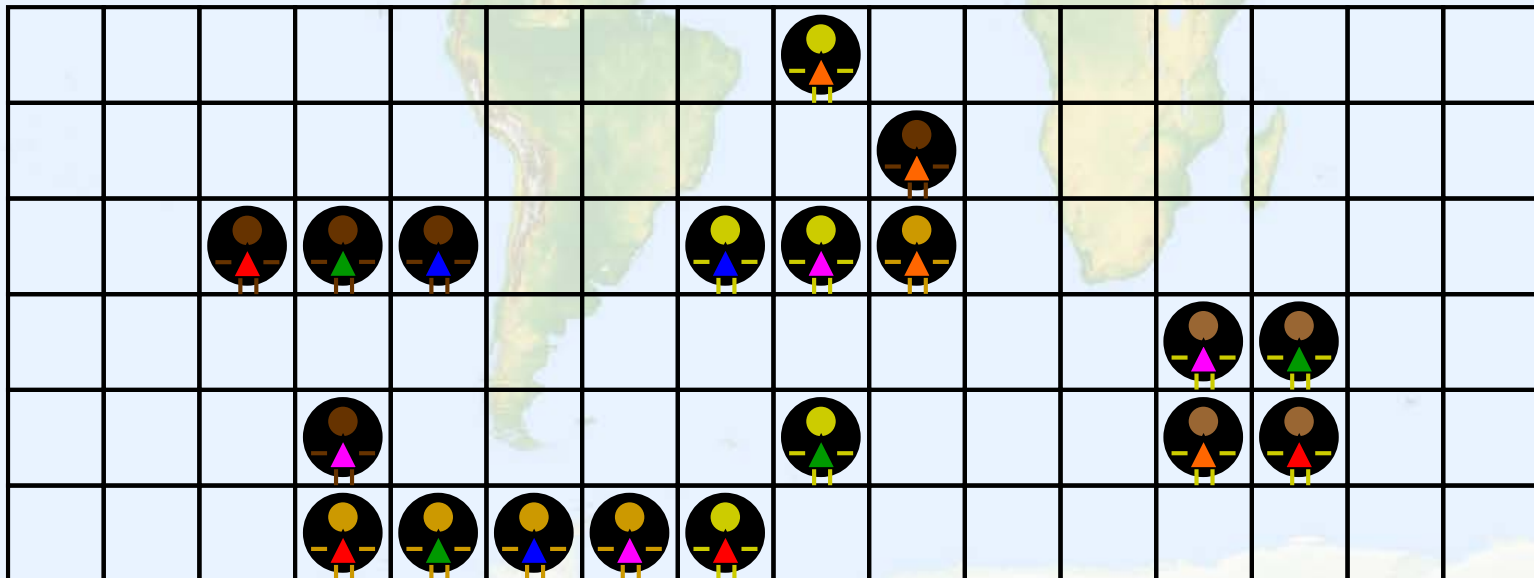
$$t^{\sigma=1} \cdot t^{\eta \rightarrow 1} \left(\frac{u \rightarrow 1}{D(c)} \right) \geq t^{\sigma=2} \cdot t^{\eta \rightarrow 2} \left(\frac{u \rightarrow 2}{D(c)} \right)$$



Scott Edwards, *The Chaos of Forced Displacement*, 2008

Agent Based Models

- Like John Horton Conway's game of "Life"
- Only with terrain
- And intelligent life
- And real human consequences





Data Visualization

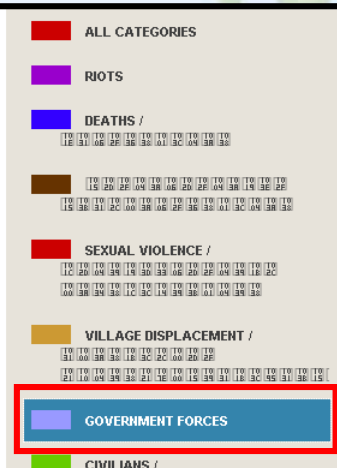
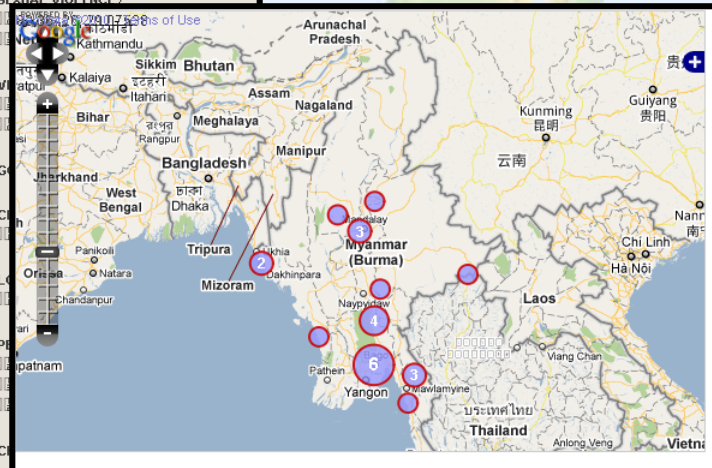
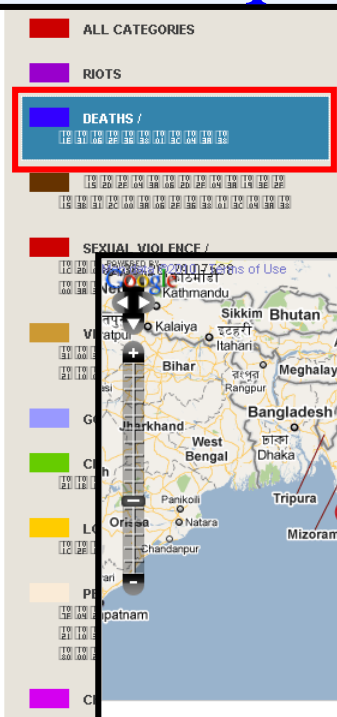
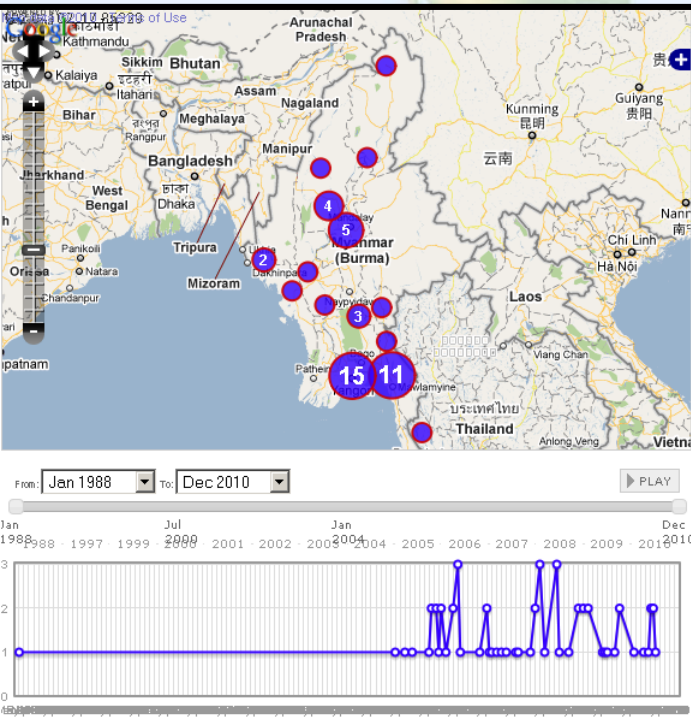
Web-based
User Customizable

Data Visualization

- Geospatial mapping
 - Like Google maps
 - Only much more serious

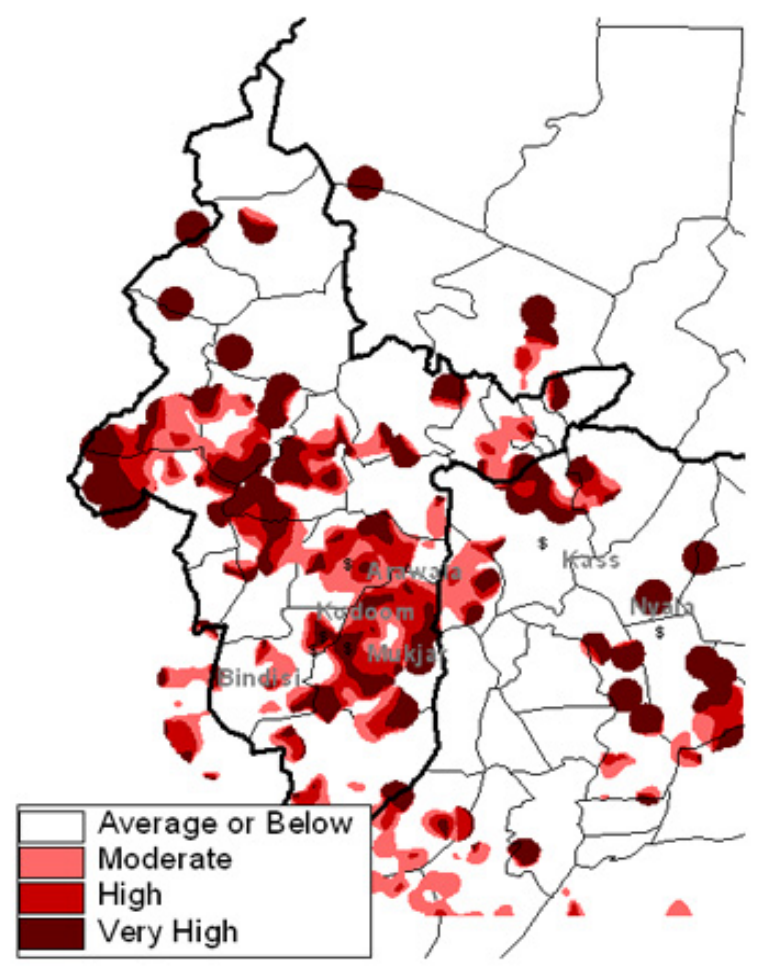
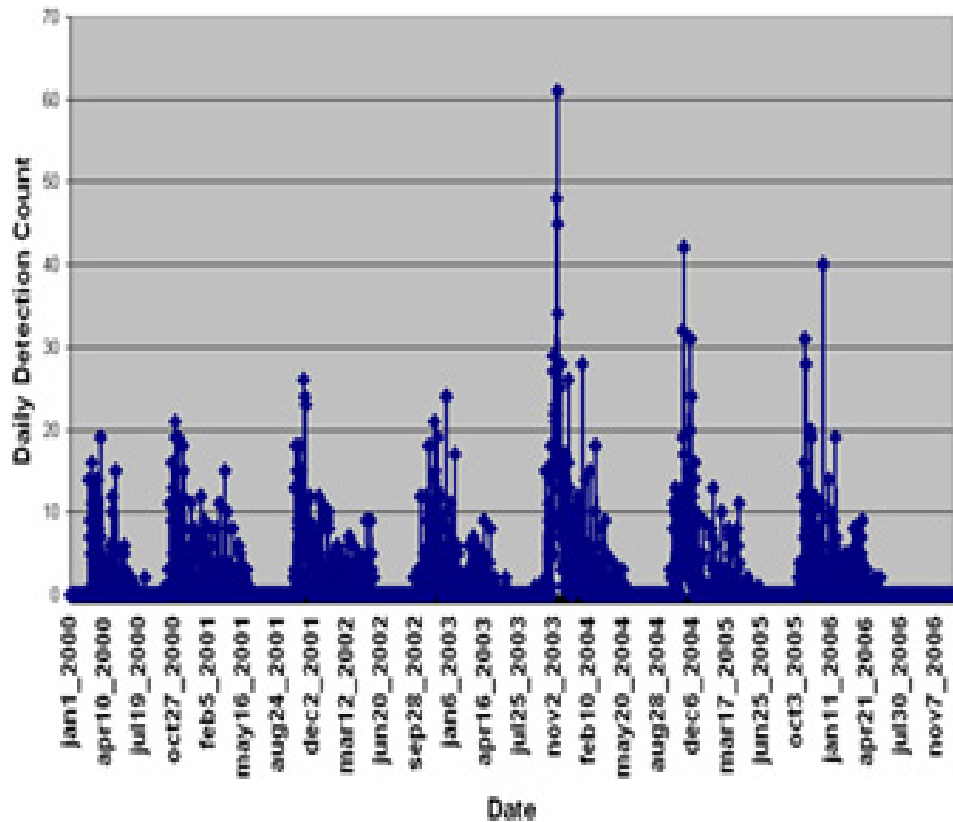
User Selectable Filtering and Combining

- Helps policy makers see the need
- See trends with time sequence images



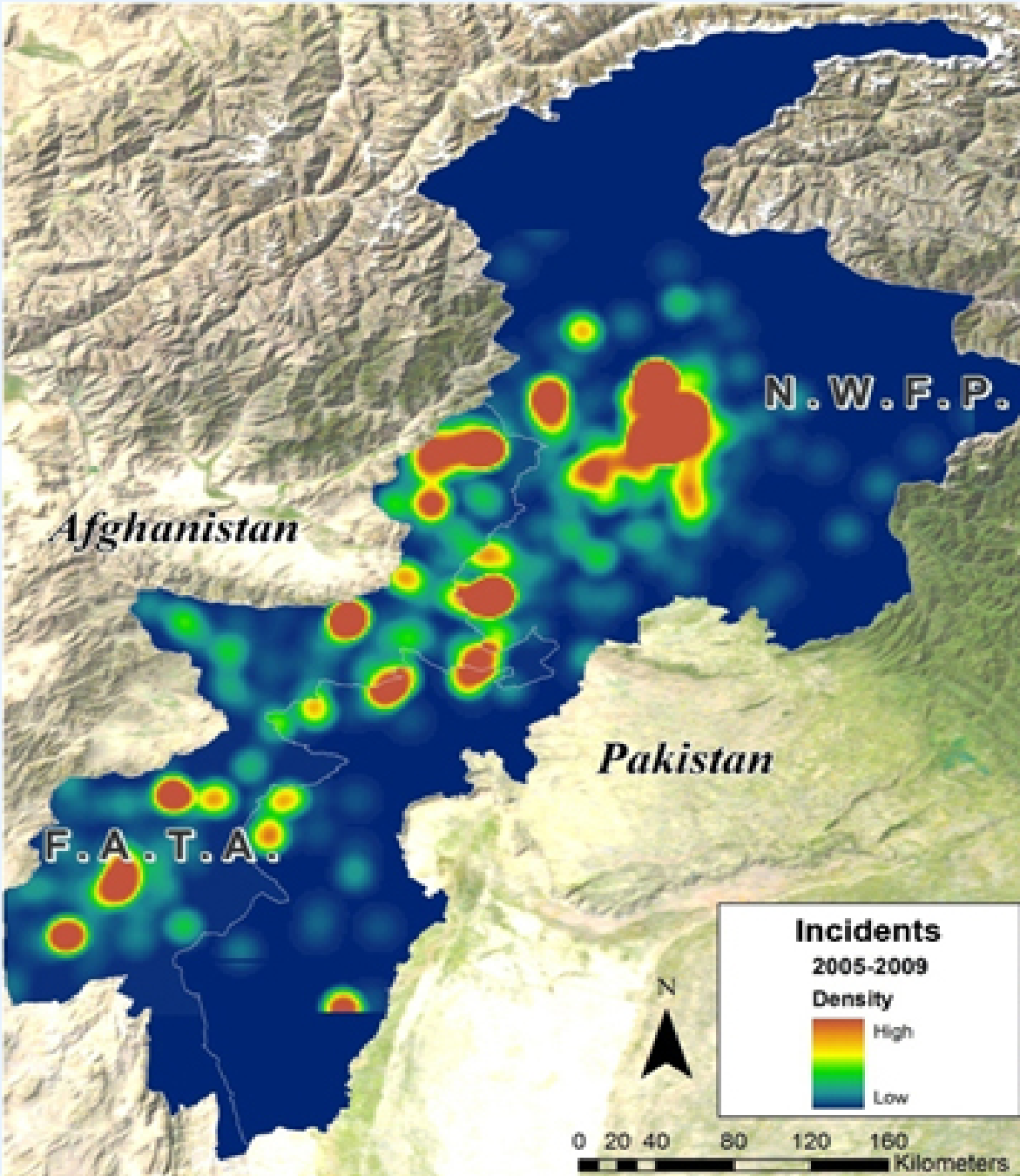
Better Tools, Better Analysis: Patterns and Trends

(Lars Bromley, AAAS)



Average Daily Fires in Darfur, Sudan Before and
During Government Offensives

Patterns and Trends



“Eyes on Pakistan”
www.eyesonpakistan.org

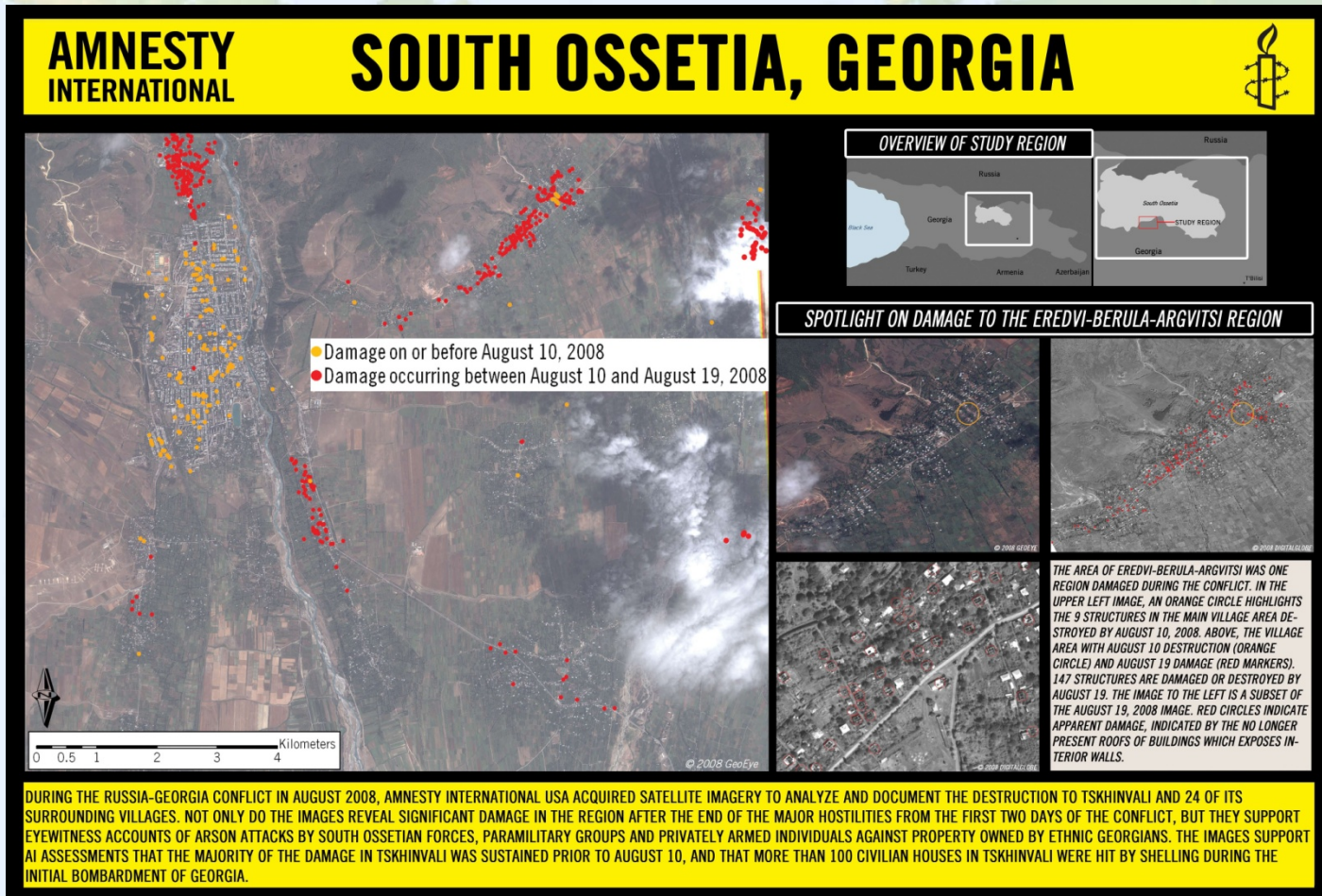
Geospatial Technologies

- Geospatial Technologies is a general term for information that is assigned to specific locations on earth
 - It is well-developed in environmental science, conservation, humanitarian relief and many other sections
 - Emerging re-application to human rights.
- It comprises a wide range of technologies, methods and tools
 - remote sensing
 - geo-positional tools (GPS)
 - mapping

Geospatial Technologies (2)

- GTs have been used to assist in documentation and research
 - producing hard evidence
 - refuting false claims.
- It has more recently increased the ability to monitor and protect populations at risk
 - producing advanced warnings of crisis for prevention methods
- Lastly, the information can be shared to stimulate activism
 - providing visual access to restricted areas within certain countries
- Support for Amnesty International work:
 - Currently a grant from the Oak Foundation (www.oakfnd.org/)
 - Shared with our science partner - AAAS's Science and Human Rights Program (shr.aaas.org/)

Research in Crises: Collecting Information Before it Disappears



Damage to civilian infrastructure during Georgian control compared with Russian occupation

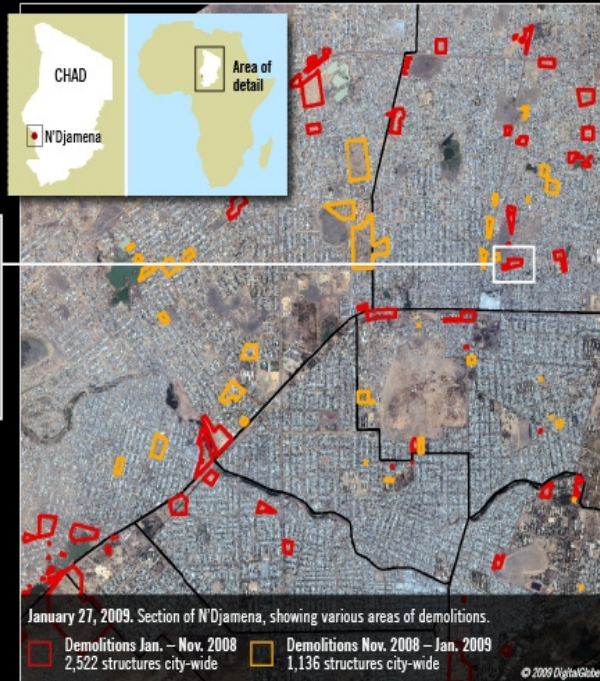
Systematic and Comprehensive



January 7, 2008. Chagoua 2 before demolitions. © 2009 DigitalGlobe



November 8, 2008. Chagoua 2 after demolitions. © 2009 DigitalGlobe



BROKEN HOMES, BROKEN LIVES. Since February 2008, thousands of homes and other structures have been demolished in several neighborhoods of N'Djamena, Chad, including the neighborhood of Chagoua 2, 7th district (pictured in satellite images above). The residents of Chagoua 2 lodged a complaint in court, which ruled that planned demolitions should cease, pending a final decision. Despite this order, the mayor of N'Djamena continued to demolish the houses. Tens of thousands of people are now homeless throughout the city after being forcibly evicted. Satellite imagery allowed Amnesty International to demonstrate the frightening pace of these housing demolitions.

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Satellite imagery allowed Amnesty International to demonstrate the frightening pace of housing demolitions in Chad

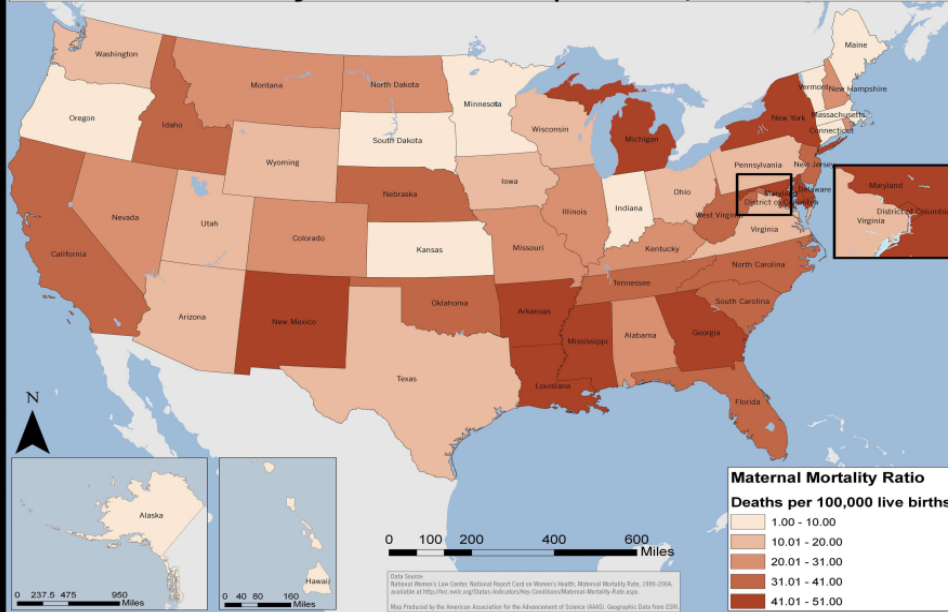
Data Accessibility

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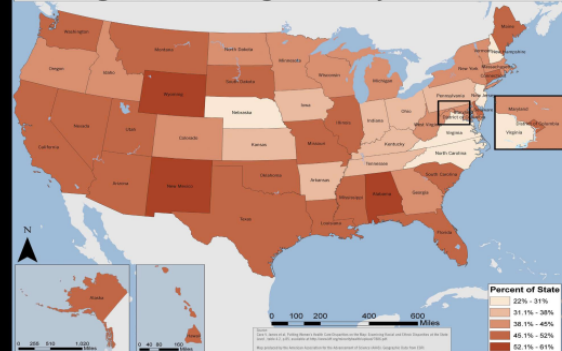
MATERNAL HEALTH CARE CRISIS IN THE UNITED STATES



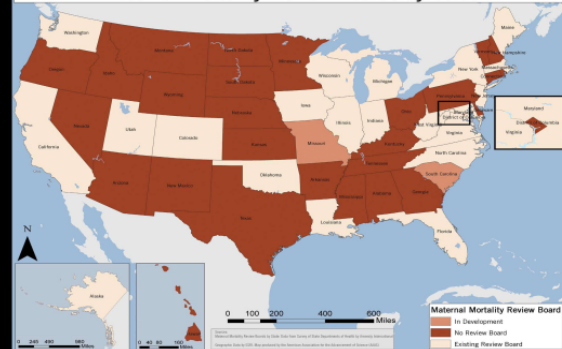
Maternal Mortality Ratio: Deaths per 100,000 Live Births



Percentage of Women Living in Medically Underserved Areas



Maternal Mortality Review Boards by State



REGIONAL TRENDS IN MATERNAL MORTALITY CAN BE SEEN (ABOVE) PARTICULARLY IN THE HIGH RATES CONCENTRATED IN THE SOUTHEASTERN US AND WASHINGTON, D.C. MAINE HAS THE LOWEST MATERNAL MORTALITY RATIO (1.2 PER 100,000 LIVE BIRTHS) AND GEORGIA THE HIGHEST (34.9 PER 100,000 LIVE BIRTHS). ADDITIONALLY, HIGH PERCENTAGES OF WOMEN LIVE IN AREAS WITH SHORTAGES OF HEALTH CARE PROFESSIONALS, INCLUDING PRIMARY CARE AND OBSTETRIC CARE PROVIDERS.

WOMEN IN THE UNITED STATES HAVE A HIGHER RISK OF DYING OF PREGNANCY-RELATED COMPLICATIONS THAN THOSE IN 40 OTHER COUNTRIES -- DESPITE THE FACT THAT THE USA SPENDS MORE THAN ANY OTHER COUNTRY ON HEALTH CARE, AND MORE ON MATERNAL HEALTH THAN ANY OTHER TYPE OF HOSPITAL CARE. APPROXIMATELY HALF OF THESE DEATHS COULD BE PREVENTED IF QUALITY MATERNAL HEALTH CARE WERE ACCESSIBLE TO ALL WOMEN IN THE USA. THERE ARE HUGE RACIAL AND GEOGRAPHIC DISPARITIES, WITH AFRICAN-AMERICAN WOMEN AT ALMOST FOUR TIMES GREATER RISK THAN WHITE WOMEN, AND WOMEN IN WASHINGTON, DC AT ALMOST THIRTY TIMES GREATER RISK THAN WOMEN IN MAINE. THIS IS NOT JUST A PUBLIC HEALTH EMERGENCY -- IT IS A HUMAN RIGHTS CRISIS.

Mapping of large-n data associated with “Deadly Delivery”

Demonstrating Scope and Severity

www.amnestyusa.org/science/explore/



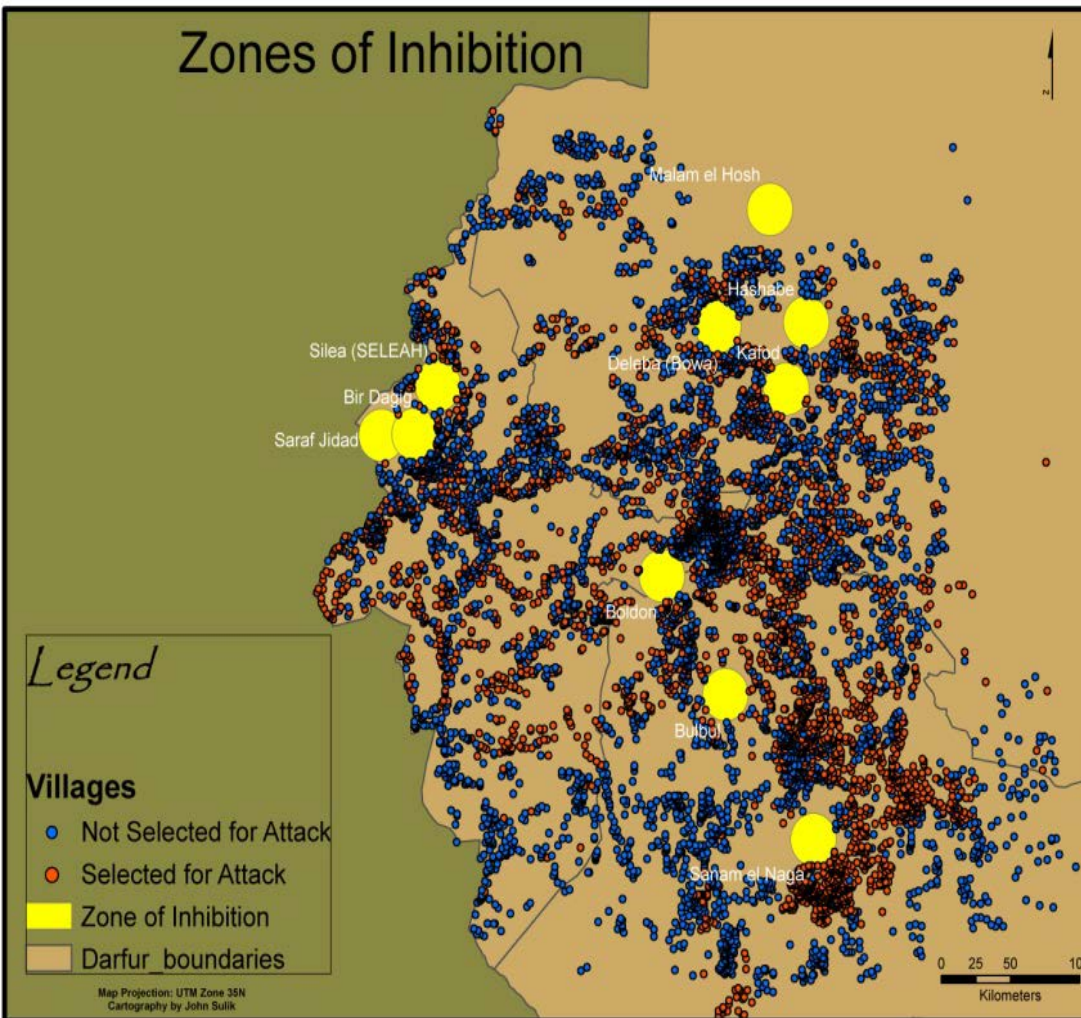
The Porta Farm community in Zimbabwe, before and after politically-motivated forced evictions. After two years, nearly no trace of former community.

Documenting Severity: Lebanon

www.amnestyusa.org/science/explore/



Advocacy: Early Intervention and Prevention



EYES ON DARFUR

JOIN US | SEND TO A FRIEND

HOME | SATELLITE EVIDENCE | VILLAGES AT RISK | THE CRISIS | TAKE ACTION | ABOUT THE PROJECT | PRESS

Hashaba

Today the inhabitants of Hashaba—most of them members of the non-Arab Zaghawa tribe—are increasingly nervous. "All roads lead to Hashaba," they say, pointing out that government troops are massed on three sides of Hashaba on roads that lead directly to Hashaba: in El Fasher to the south, Mellit to the east and Kutum to the west.

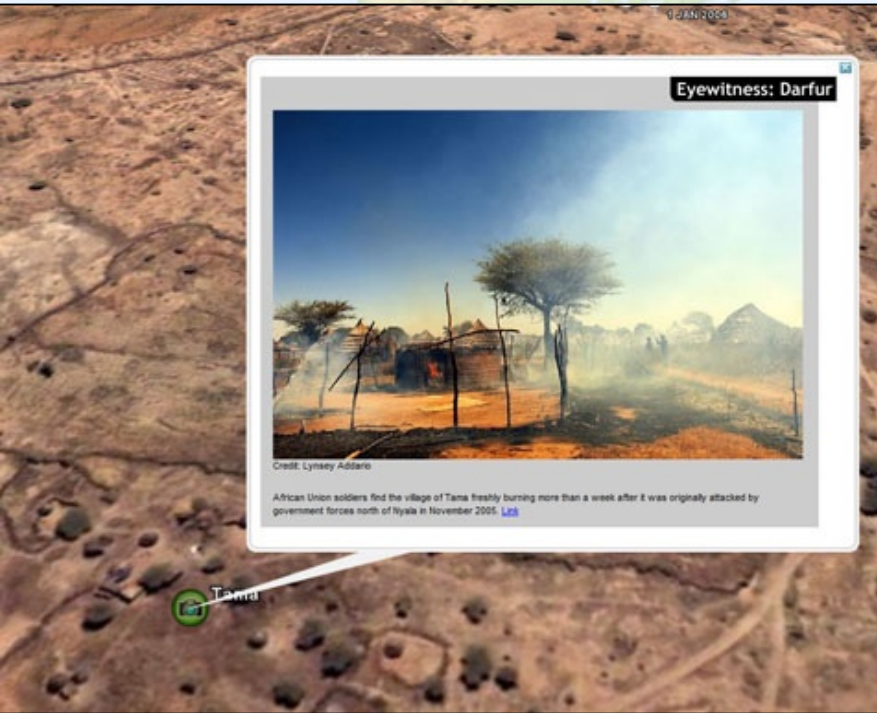
Read the full report from Hashaba >
Take action now to protect this village >

Back to main map | zoom out

Impact Analysis of "Eyes on Darfur" protective sites

www.eyesondarfur.org

Bringing Research Materials to Life

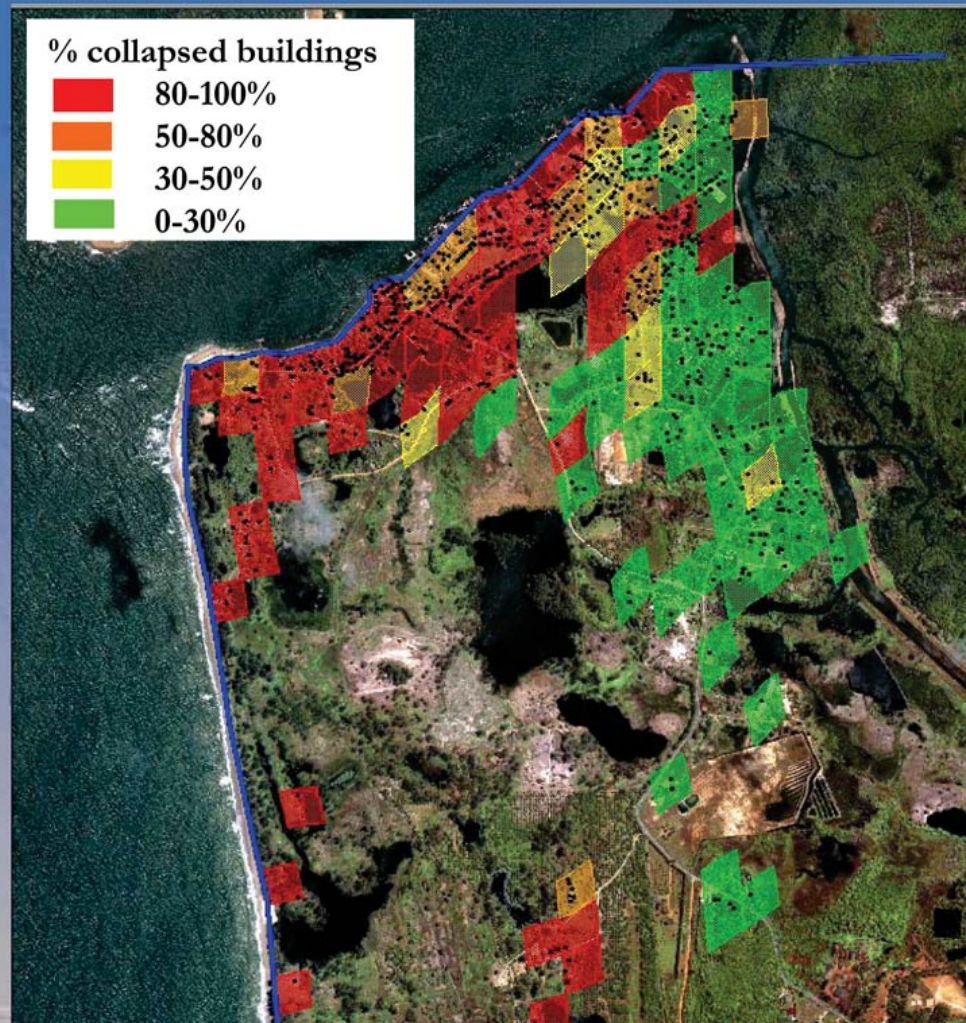
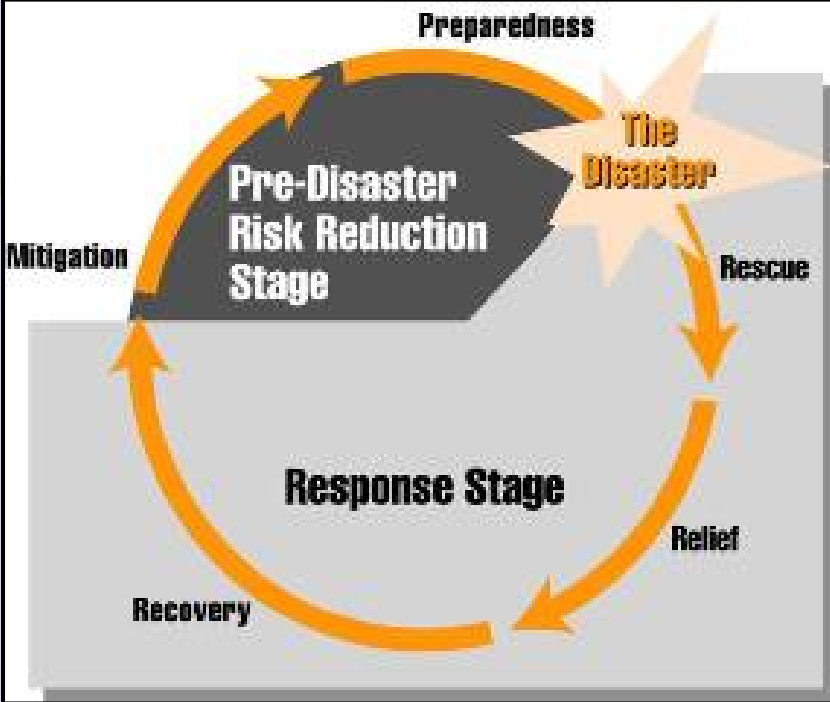


Tama, a town in S. Darfur, following an attack by government soldiers in 2005.



Eyewitness testimony from Kutum, in N. Darfur, following a Janjawid attack.

Breaking Crisis Cycles

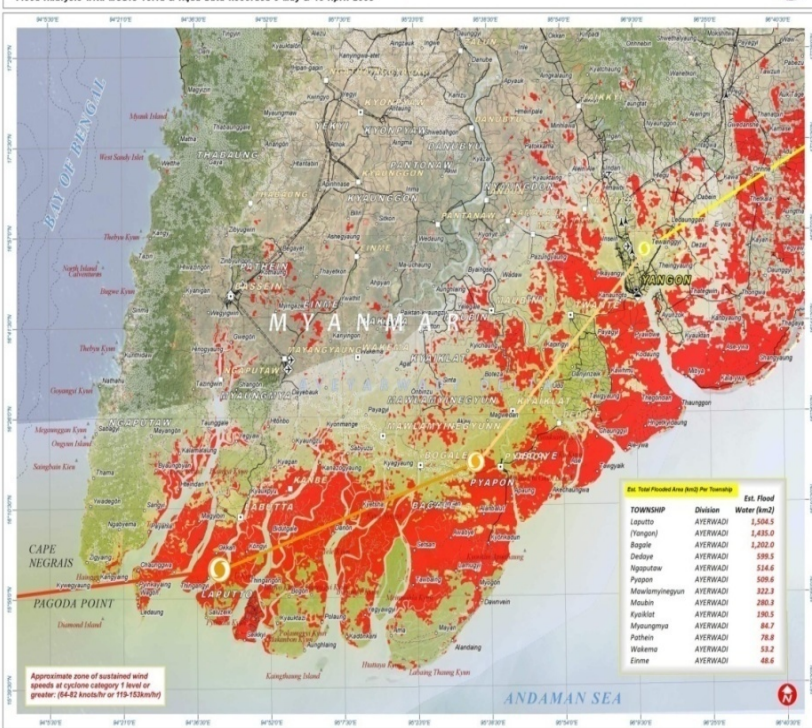


FIRMS fire alerts survey entire earth twice a day

Prediction, detection, and rapid response

Setting the Human Rights Agenda in the Context of Disaster

FLOOD ASSESSMENT FOR CYCLONE NARGIS AFFECTED AYEYARWADY DIVISION, MYANMAR



Cyclone Nargis
5 May 2008
Version 1.1
TC-2008-00007-MMR

Legend

- Capital
- International Border
- City/Town
- State Road
- Highway
- Secondary Road
- Canal
- Railway
- Ship
- Track Path
- Wedge
- Railroad
- Airfield
- Utility Line
- Port
- Tower

SEE CYCLONE NARGIS TRACK & WIND SPEED

SATELLITE FLOOD ANALYSIS

Map Scale for A2: 1:900,000

UNOSAT
satellite solutions for all
247 Redburn, +41 73 281 4998
www.unosat.org

SATELLITE - BASED GAZA DAMAGE ASSESSMENT OVERVIEW

Summary of Gaza Damages by Type:

- Buildings: Destroyed & Severely Damaged = 2,692**
- Impact Craters on Roads & Bridges = 220. Est. length of Paved and Unpaved Roads/Tracks damaged = 167km**
- Impact Craters on Open Ground/Cultivated Land = 714 Damaged. Destroyed Cultivated Land Area = 2,100 ha**
- Greenhouses Destroyed/Severely Damaged = 187. Est. Area of Greenhouses = 28ha**
- Demolition Zones: Est. area targeted by IDF bulldozers, tanks & phosphorus shells for demolition = 2,342 ha**

GAZA NORTH
585
256
88
88

GAZA
1000
172
82
74

MIDDLE AREA
95
50
9
13

KHAN YUNIS
241
83
25
16

RAFAH
739
141
20
20

19 February 2009
Version 1.2
UNOSAT-2009-000022

Map Legend

- Border Crossing Point
- Refugee Camp
- Urban / Builtup Zone
- IDF Security Zone
- International Border
- 1968 Armistice Line
- Governorate Boundary

DENSITY OF DETECTED DAMAGES
Density of detected damages increases from yellow to red

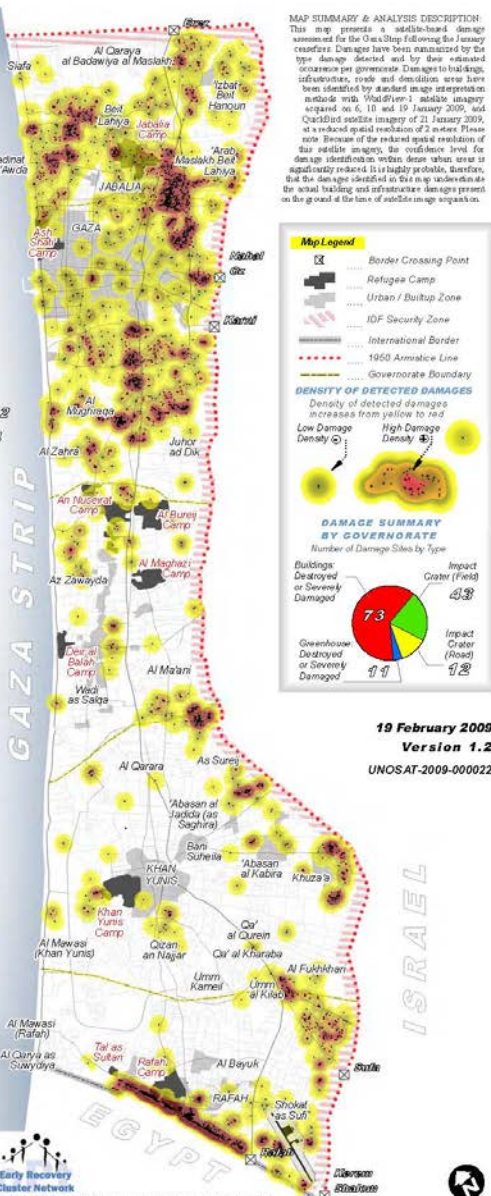
DAMAGE SUMMARY BY GOVERNORATE
Number of Damage Sites by Type

Buildings: Destroyed or Severely Damaged: 73
Impact Crater (Field): 43
Impact Crater (Road): 12
Greenhouse Destroyed or Severely Damaged: 11

Satellite Image: WorldView-1 & QuickBird Resolution: 2m (Reduced Resolution)
Imagery Dates: 27, 19, 10 & 8 January 2009
Geographic: WestView - Digital Globe (2009)
Damage Analysis: UNOSAT
GIS Data: UNRWA, OCHA, UNDP, WHO, UNOSAT
Projection: UTM Zone 36 North - WGS-84

UNOSAT satellite solutions for all
unitar United Nations Institute for Training and Research
Early Recovery Cluster Network

The depiction and use of boundaries, geographic names and related data shown here are not warranted to any other than the entity which provided the information, research and analysis. UNOSAT is a program of the United Nations Institute for Training and Research.



UNICEF: Access to relief

UNICEF: in Gaza

A light blue and green world map serves as the background for the slide. The text is centered over the map.

Training and Education

System Administration

Reporters

Rules of Evidence

Engaging the Public

Administrators and Reporters

■ Administrators: Information Technology (IT)

- Setup and run a data center
- Reporter and user technical support
- Information source secrecy and access
 - Can be complicated
 - Can sources be permanently anonymous?

■ Reporters

- Manage passwords

■ Rules of evidence

- For both administrators and reporters

■ AI SHR staff trained administrators in Uganda and Kenya

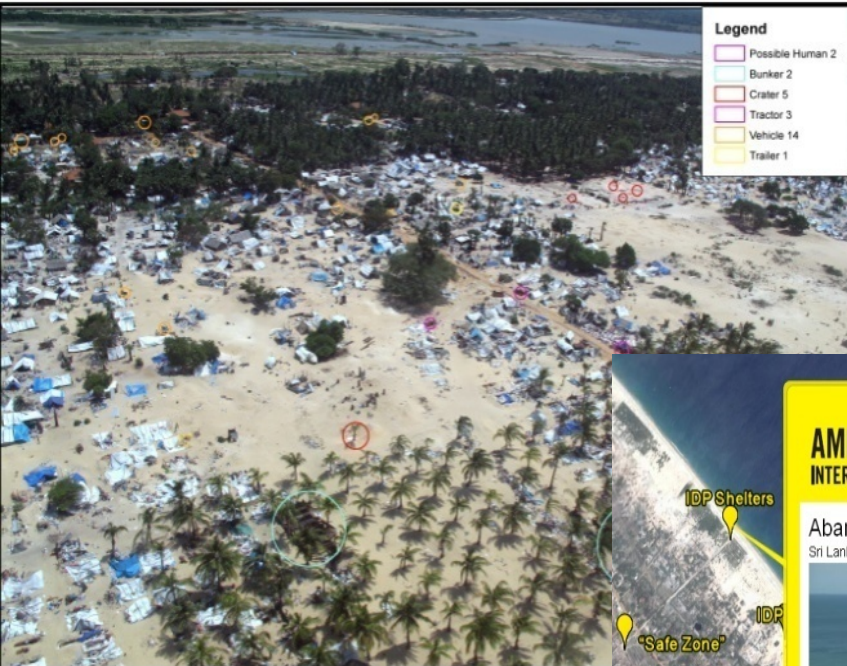


Mission Planning and Support

- AIUSA's SHR staff work with International Secretariat researchers to help plan and support field work.
 - Equipping mission teams with technology
 - geopositioning tools
 - satellite communications
 - digitized base maps of unfamiliar and previously unmapped areas
 - While on the ground, coordinate with teams to
 - identify potential HR abuses
 - contextualize local reporting and testimony

Engagement and Awareness: Helping the Public to Explore

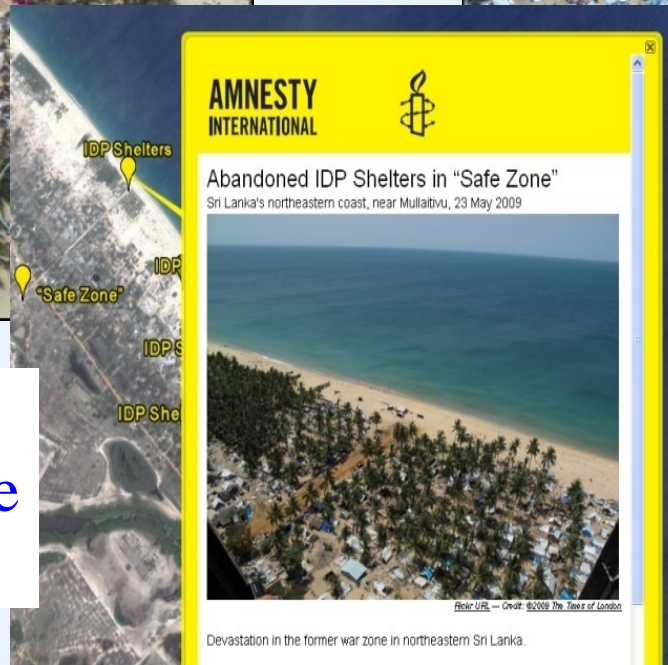
IMG 7965



IMG 7966



Images from
helicopter and satellite
put on Google earth



AIUSA's Google Earth views during the Sri Lanka crisis



Economic, Social, and Cultural Rights (ESCR)

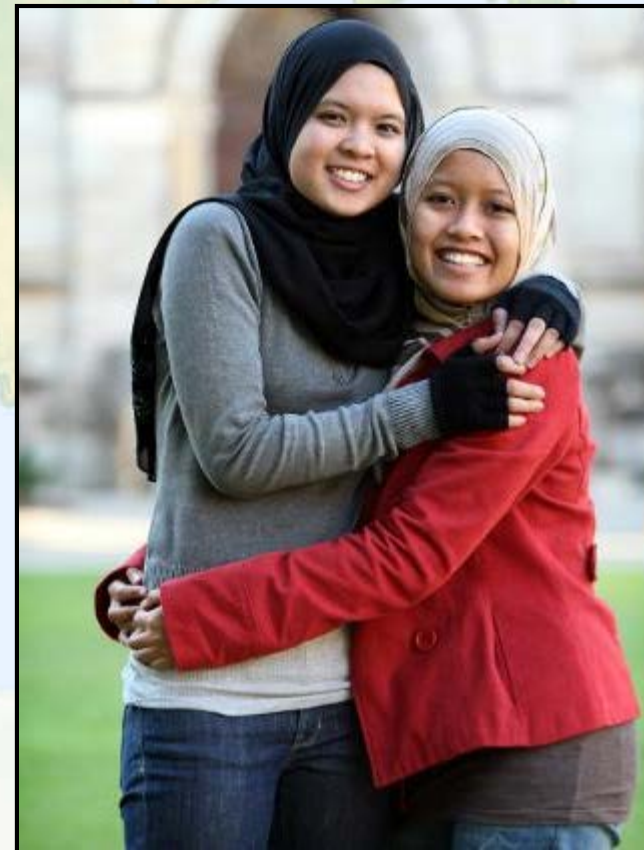
Cultural Differences

Cell Phones

Reproductive Rights

Economic, Social, and Cultural Rights (ESCR)

- Cultural differences are huge
 - Much bigger than most Americans realize
- Cultural rights is an extremely sensitive topic
- Where does culture end, and abuse begin?
 - What if the supposed victim agrees that the practice is appropriate or desirable?
 - What if the supposed victim is a child, and cannot give informed consent?



Reproductive Rights

- Birth Control
 - Pills
 - Spousal consent
 - Implant
 - Skin patch
 - Education for informed choice: side effects
- Abortion
 - Spousal consent
- Sterilization



Coming Soon...

- **Using remote sensing to:**
 - Detect gas flaring, home demolitions, and violations of International Humanitarian Law in the Niger Delta
 - Access displacement camps surrounding Mogadishu
- **Use Automated Data Collection to:**
 - Develop models for a comprehensive human rights crisis early warning system
 - Respond to crises through direct, “crowdsourced” information
- **Use geovisualization techniques to:**
 - Increase engagement with activists and policy makers
 - Use participatory Geographic Information Systems (GIS) to find and expose secret detention facilities

Are Cell Phones a Human Right?

- Are cell phones an economic right?
 - Huge quantitative and qualitative economic advantage
 - In many regions, cell phones are key to the “right to work”?
- Key to reporting and documenting abuse
 - Camera, video, and GPS
- Almost have to ask:
In today’s world,
Are cell phones a
human right?



The Next Boundaries

- Improving computational modeling reliability
 - Forecasting Crises
 - Predicting refugee migration routes
- Artificial Intelligence Systems
 - Damage recognition
- Integrated, purpose-built systems
 - Easy to set up
 - Easy to use
 - Secure

“When Elephants Fight, the Grass Gets Trampled”



-
- AAAS is a standing partner with AIUSA under the OAK Grant
 - AAAS works with other organizations, too
 - Scott Edwards: 1/2 SHR Directory, 1/2 Advocacy Director for Africa



Scott Edwards

The Chaos of Forced Migration

A Means of Modeling Complexity
for Humanitarian Ends