

# Evaluating community resilience : A new database can help strengthen resilience in your own community

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Catalyst is funded by:



University of Essex Catalyst project working in partnership with:



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# Community Development

**Extend concept of the future**

**Save resources now for future use**

*Sustainability*

**Strengthen the ability to withstand shocks**

*Resilience*



# Community Resilience

the sustained ability of a **community** to utilize available resources (energy, communication, transportation, food, etc.) to respond to, withstand, and recover from shocks

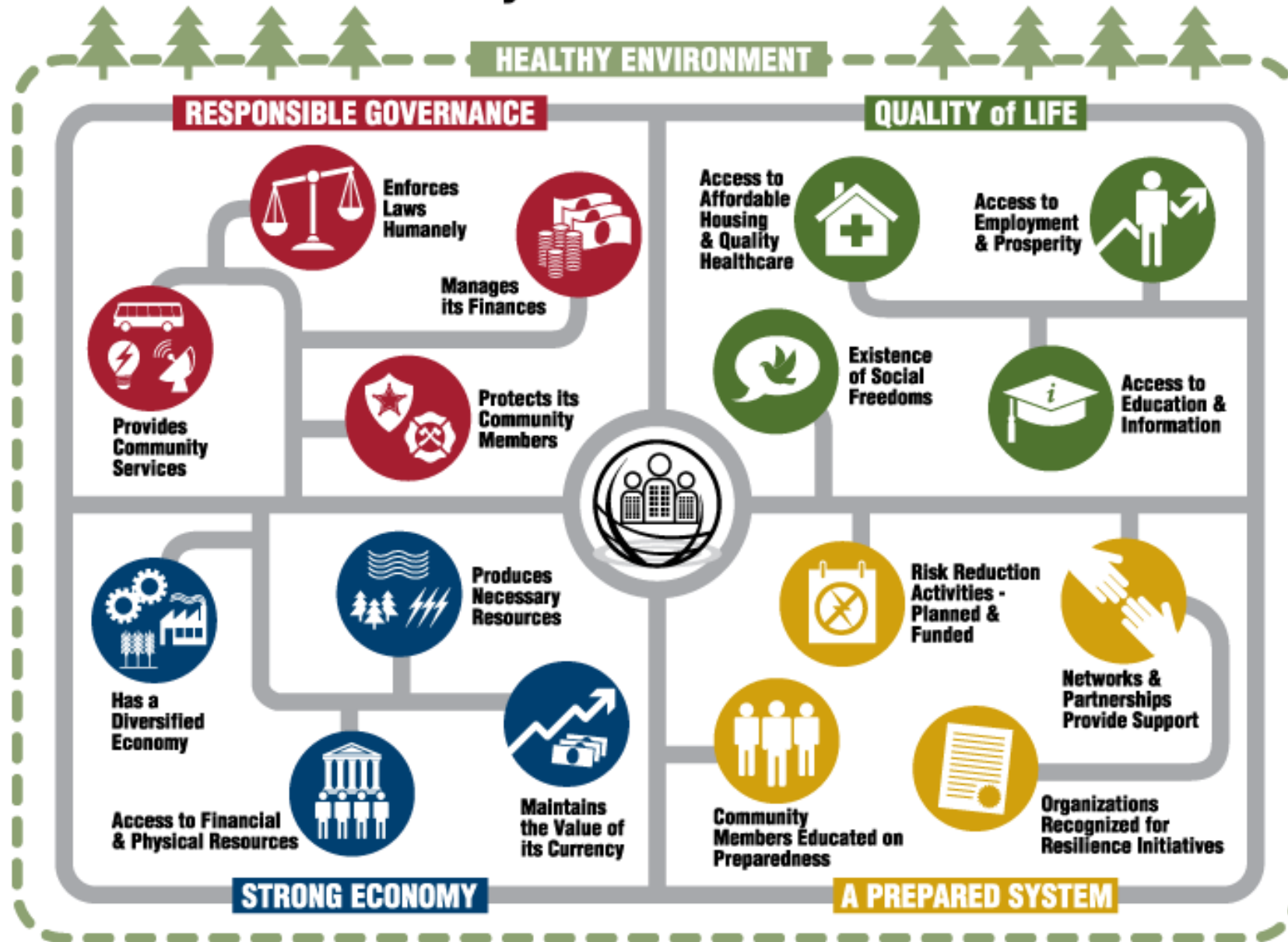


# disaster

Disruption to society caused by a critical event  
(an unplanned shock)



# Community Resilience Framework™





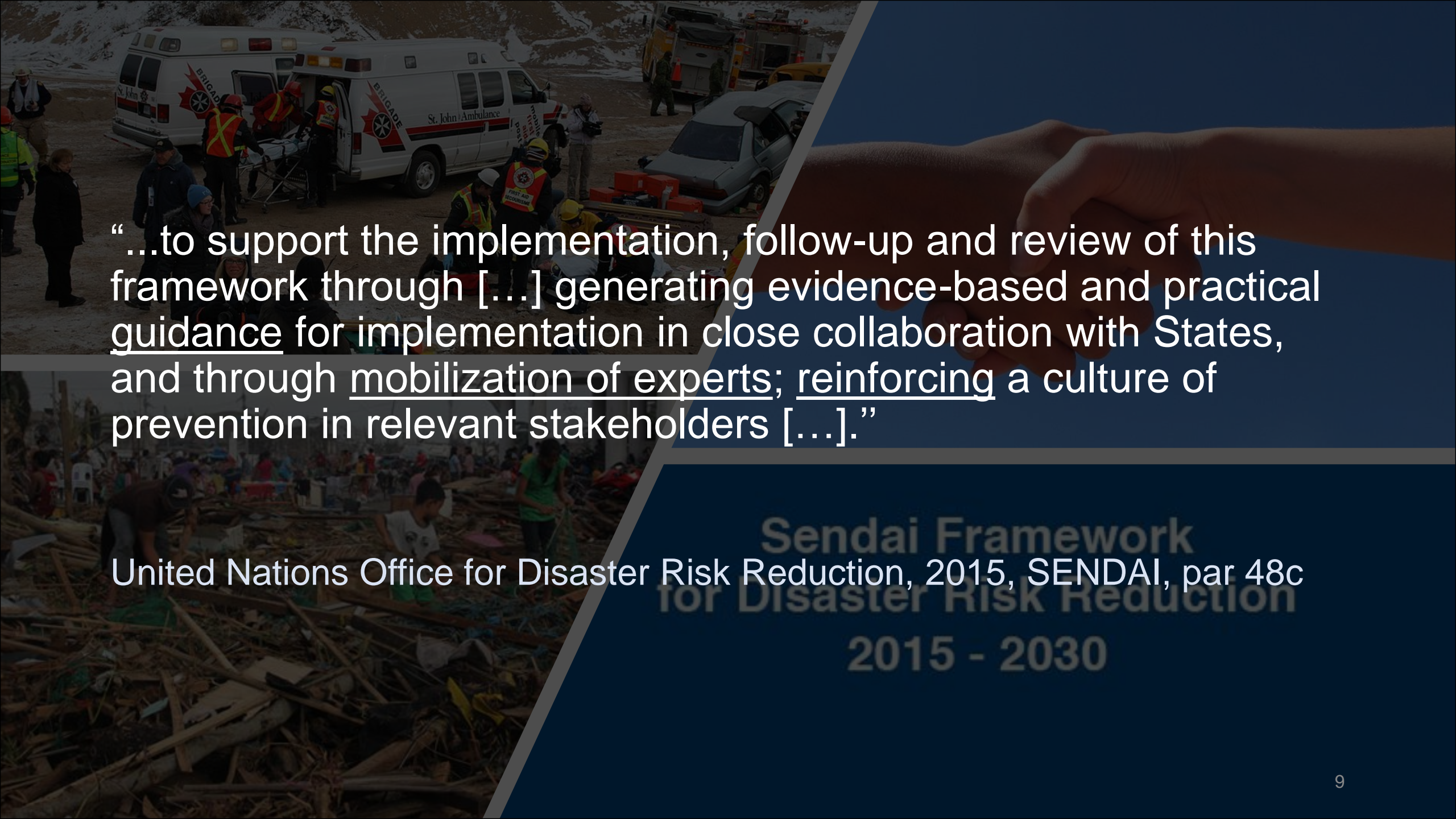
**POLICY**





# Sendai Framework for Disaster Risk Reduction 2015 - 2030



The background of the slide is a composite image. The top left shows an emergency scene with several white ambulances from St. John's Ambulance. One ambulance has its rear door open, and a stretcher is being used. People in high-visibility vests and uniforms are present. The bottom left shows a large pile of debris, likely from a destroyed building, with people in the background. The right side of the slide features a dark blue background with a close-up image of two hands shaking, symbolizing agreement or partnership.

“...to support the implementation, follow-up and review of this framework through [...] generating evidence-based and practical guidance for implementation in close collaboration with States, and through mobilization of experts; reinforcing a culture of prevention in relevant stakeholders [...].”

United Nations Office for Disaster Risk Reduction, 2015, SENDAI, par 48c

Sendai Framework  
for Disaster Risk Reduction  
2015 - 2030

## SENDAI definition

Resilience is:

*“the ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structure and functions through risk management”.*



## Sendai Framework for Disaster Risk Reduction 2015 - 2030

# Resilience Action Plans Project Motivation

- Plethora of measurement frameworks, addressing aspects of resilience
- But none that includes policy information



# Resilience Action Plans Project Motivation

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# Resilience Action Plans Project Motivation

- Plethora of measurement frameworks, addressing aspects of resilience
- But none that includes **policy information**
  - disaster and emergency indicators
  - socio-demographic indicators
  - risk information
  - eco-system data

# *What if...*

*...we gathered resilience plans?*

high-level strategic documents  
describing the ways an authority  
should react in case of emergency,  
and how it plans to build capacity  
to improve resilience





Can we expect every authority to have a resilience plan?



Nationally, yes  
Provincially, yes  
Municipally, maybe



Not available online in all cases



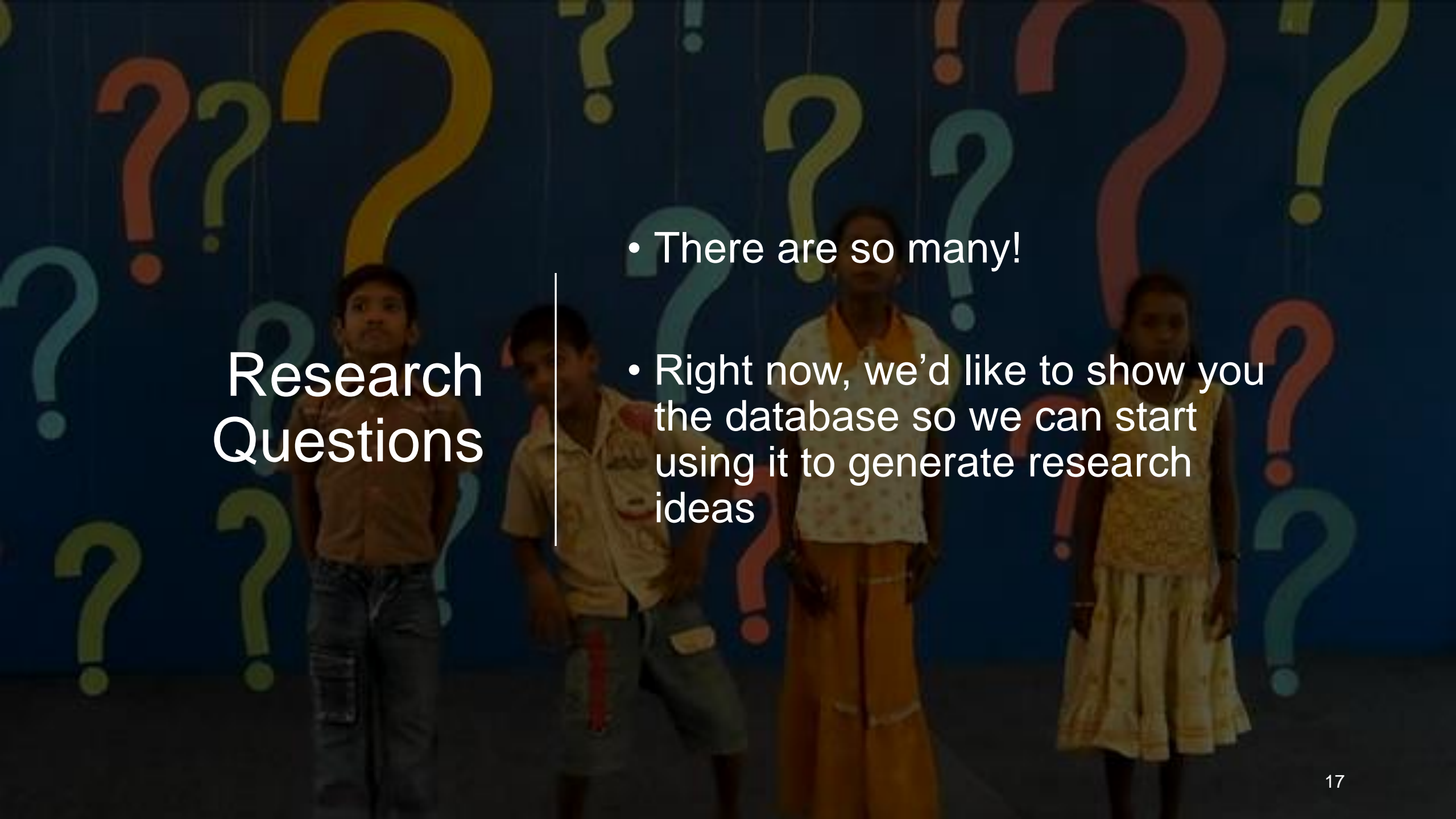
Multiple languages



So, we set out to:

- Create global database of national government resilience policies
  - (Resilience Policy Database)
- Create *policy proximity score* vis-à-vis the Sendai international standard
  - (cosine similarity)
- Examine what might drive or be driven by policy proximity score
  - Revenues, per capita income, public spending
  - Disaster resilience, foreign aid



The background of the slide features a dark blue field filled with numerous colorful question marks in shades of yellow, orange, green, and light blue. In the center, four children are visible, slightly faded. From left to right: a boy in a light-colored shirt and jeans, a boy in a light-colored shirt and shorts, a girl in a white patterned top and orange pants, and a girl in a white patterned top and a white skirt.

# Research Questions

- There are so many!
- Right now, we'd like to show you the database so we can start using it to generate research ideas



# Advancing A Resilience Index For Sustainable Ecosystems

The Advancing a Resilience Index for Sustainable Ecosystems (ARISE) Initiative, is an interdisciplinary project bringing together academics, practitioners and government officials to improve our understanding and measurement of resilience in the context of natural disasters and sustainable ecosystems.

A first peek at the Resilience Policy Database and the Resilience Policy Index

[Learn More about ARISE »](#)

[Explore our Resources and Data »](#)

An aerial photograph of a tropical island. In the foreground, there is a resort with several buildings and swimming pools. A long pier extends from the island into the clear, turquoise water. In the background, another island is visible under a blue sky with scattered white clouds.

# Advancing A Resilience Index For Sustainable Ecosystems

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[Learn More about ARISE »](#)

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# Data – Resilience Policy Database

Resilience policies: *high-level strategic documents of how a state or municipality should react in case of emergency and how it can build up capacity to improve its resilience.*

- *Resilience?*
- *What is a plan?*
- *How do we define disaster?*

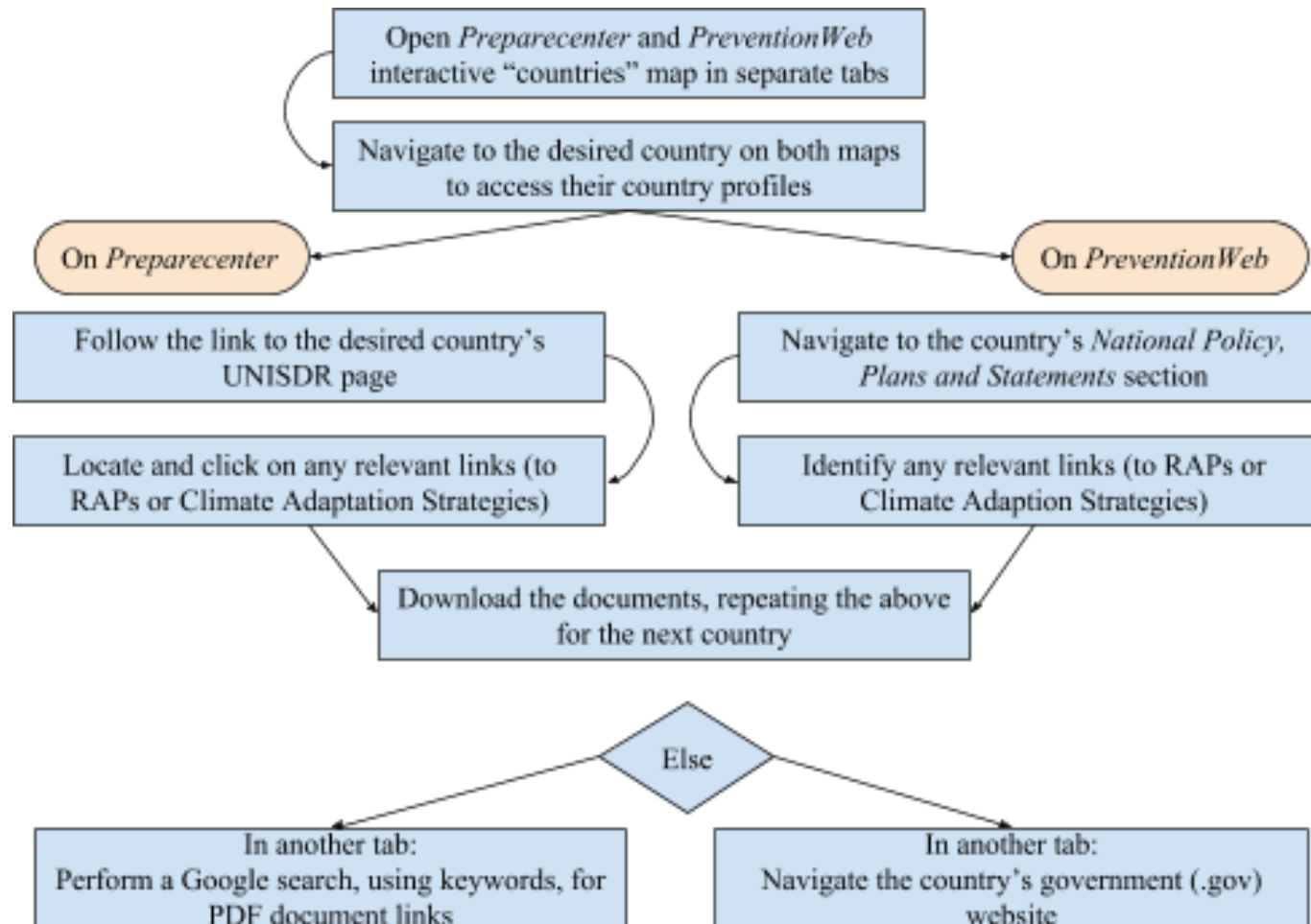


# Data – Resilience Policy Database

Resilience policies: *high-level strategic documents of how an authority should react in case of emergency and how it can build capacity to improve its resilience.*

- *Resilience?* *To adapt, absorb or bounce forward*
- *What is a plan?* *Strategic and operational*
- *How do we define disaster?* *Unplanned shocks/hazards*

# Document collection process



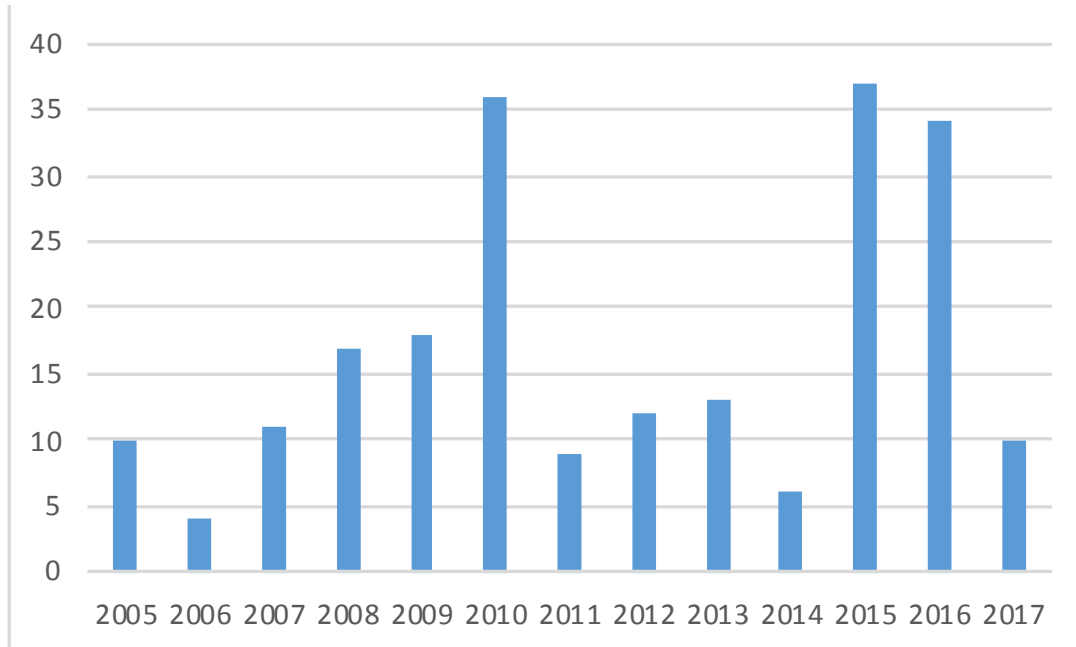


# Data – Resilience Policy Database

Current coverage:

- 240 national disaster management and development plan documents from countries across the world (Africa, Americas, Asia, Australia, Europe) [circa 3.5 million words]
- Smaller subset of subnational plans
  - US states
  - South African provinces
  - Beginning collection of UK counties
- 5 languages (English, French, Arabic, Russian, Spanish)
- Years of policy release: 2005 - 2017

Distribution of documents by year policy was released



# Data – Resilience Policy Database

- Data collection via Desk research

Searched the web for such documents via governmental, disaster and emergency preparedness portals (PreventionWeb, PrepareCenter) etc as well as on national disaster center websites e.g. FEMA for the US

- Start contacting authorities in second phase



**A few observations...**

# Observations

- A few countries have more information available online at subnational level, whereas most have very little information online
- Africa offers less information available overall compared to other continents
- High percentage of African policies (60-70%), compared to other areas, are scanned copies (ie. not born digital) – create additional work with processing to machine readable text
- There are no historical policies available (all policies are the current version)

An aerial photograph of a tropical island. In the foreground, there is a resort with several buildings and swimming pools. A long pier extends from the shore into the clear, turquoise water, leading to a long row of overwater bungalows. The background shows a smaller island and a vast blue ocean under a bright sky with scattered clouds.

# Advancing A Resilience Index For Sustainable Ecosystems

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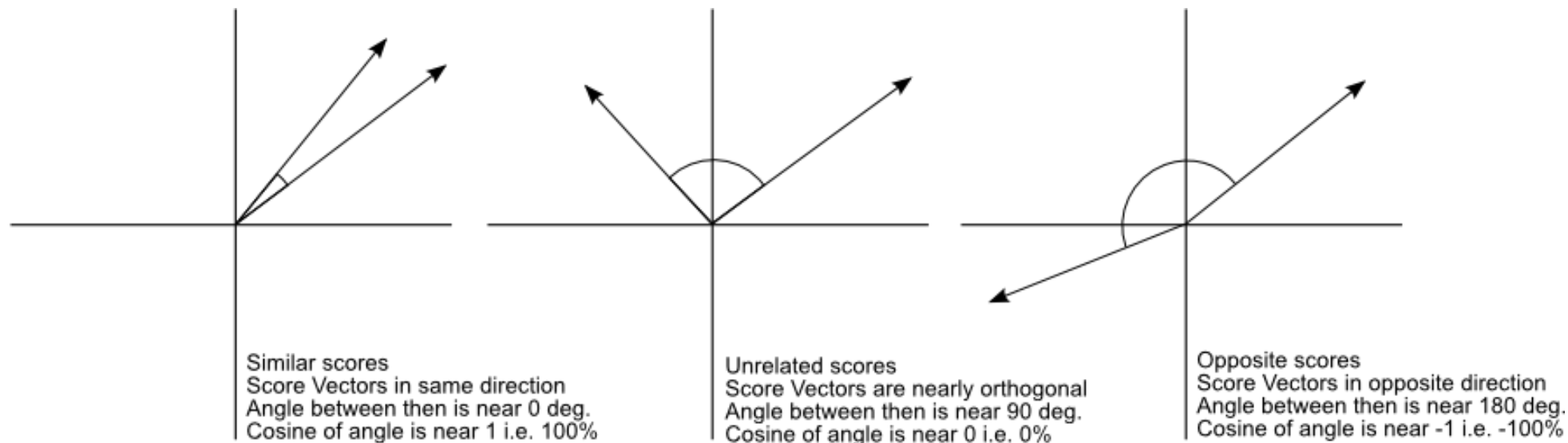
[Explore our Resources and Data »](#)

# Calculating the Policy Proximity Score

- model each document in the Vector space
- use a well-known similarity measure (Cosine Similarity) to calculate the similarity between different documents



# Calculating the Policy Proximity Score



$$\text{similarity} = \cos(\theta) = \frac{\mathbf{A} \cdot \mathbf{B}}{\|\mathbf{A}\| \|\mathbf{B}\|} = \frac{\sum_{i=1}^n A_i B_i}{\sqrt{\sum_{i=1}^n A_i^2} \sqrt{\sum_{i=1}^n B_i^2}},$$

Packages:

- R quanteda (pre-processing, lemmatizing)
- Word2Vec (word vector representation)
- Cosine.Similarity (R package, Vadim Nazarov)

An aerial photograph of a tropical island. In the foreground, there is a resort with several buildings and swimming pools. A long pier extends from the shore into the clear, turquoise water. In the background, there is a smaller, forested island. The sky is blue with some white clouds.

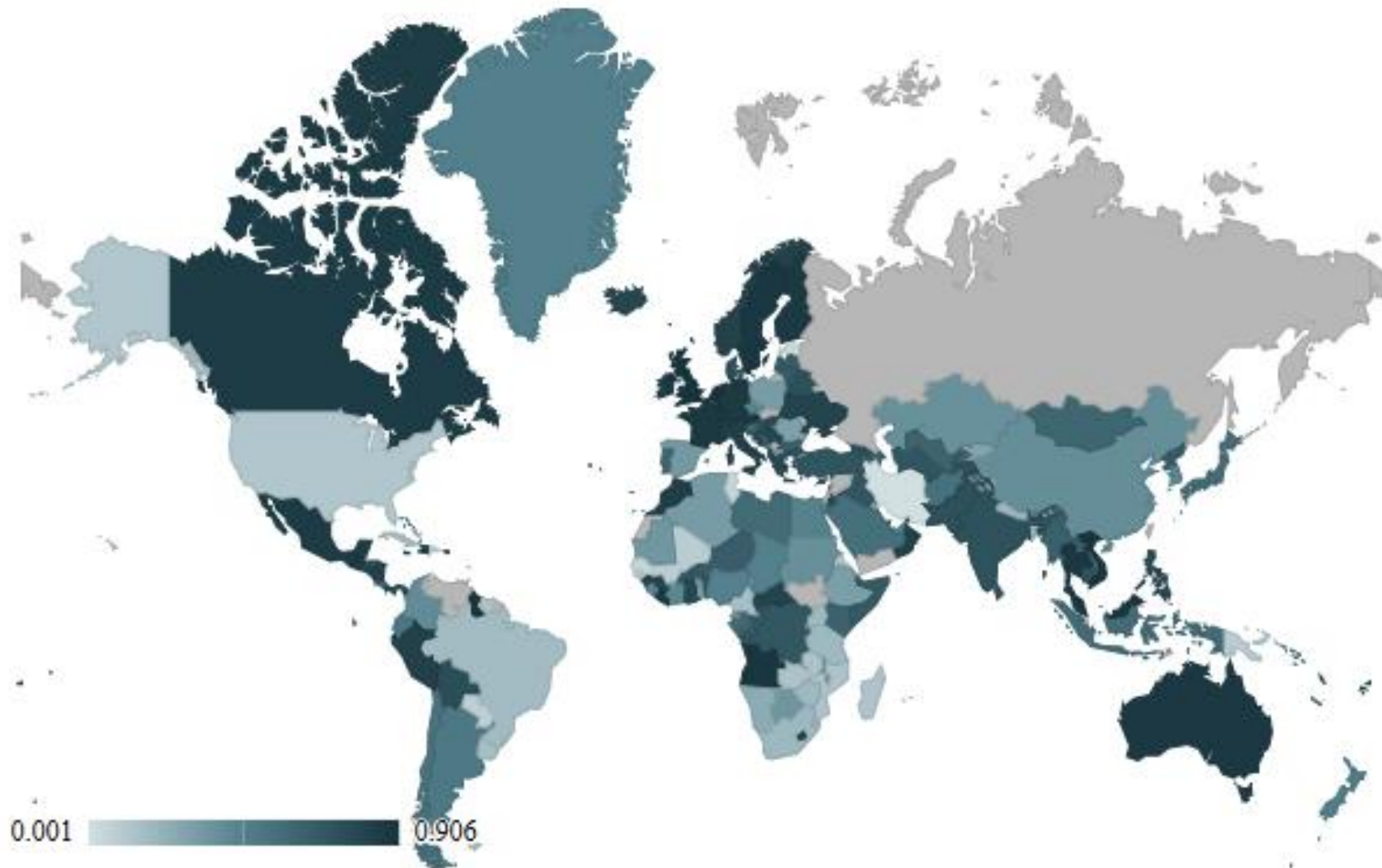
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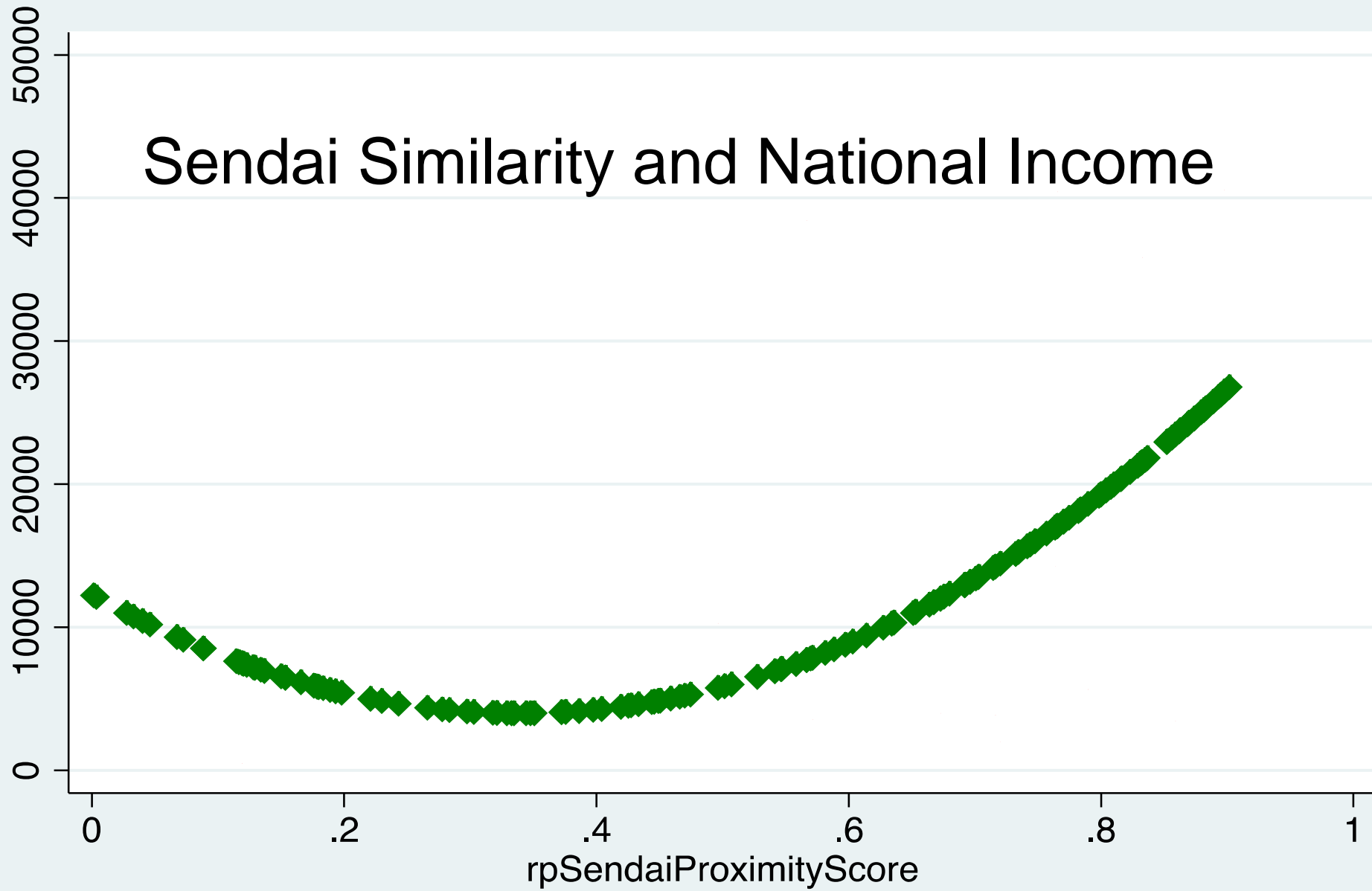
# Similarity scores around the world



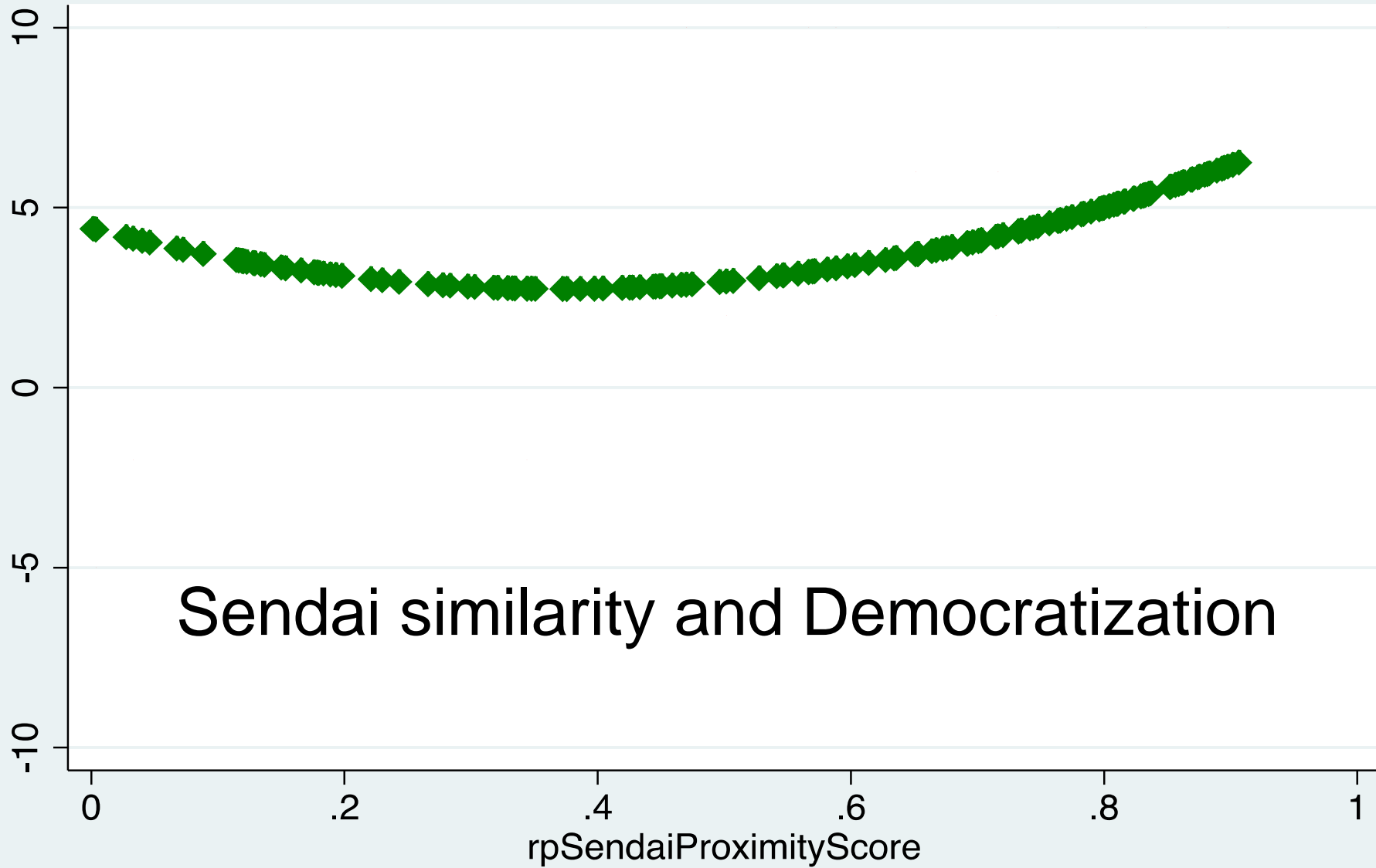
- Poorer countries with intense disasters tend to have more recently drafted policies
- Richer countries lose more money from disasters
- Poorer countries lose more people, economic activity, and recovery time from disasters
- Rich democracies suffer the least amount of deaths and damages



# Sendai Similarity and National Income



wbgdp1    ◆ Linear prediction



# Sendai similarity and Democratization

p4polity2    ◆ Linear prediction



## Next Steps: Research

- Explore exciting questions:
  - Does policy matter?
  - How does climate change influence how we should communicate micro and macro level responses to disaster?
  - What policies are most effective at protecting vulnerable groups?
  - Are there risks to adopting a cross-national resilience building framework, such as Sendai?
- Combine insights from text analysis with satellite imagery and other disaster, risk and environmental indicators



A person with dark hair, wearing a red shirt, is seen from the side, looking down at a globe on a floor made of large, light-colored hexagonal tiles. The scene is dimly lit, with the person's face and the globe being the primary light sources. The background is dark and textured with the same hexagonal tiles.

## Using our Resilience resources

- Explore & download different policies on disaster and emergency around the globe
- Consult the additional resources (bibliography) with specialised articles on the topic of disaster and emergency management and resilience
- Experiment with the Policy Proximity Index (in progress)



# Thank you! Questions?

- Live repository:

<https://arise.essex.ac.uk>

- Get in touch if you would like to know more:

[gina.reinhardt@essex.ac.uk](mailto:gina.reinhardt@essex.ac.uk) (Gina)

[qk17214@essex.ac.uk](mailto:qk17214@essex.ac.uk) (Queal)

[achats@essex.ac.uk](mailto:achats@essex.ac.uk) (Kakia)



Catalyst is funded by the Higher Education Funding Council for England.



University of Essex working in partnership with:





# Extra Slides



## Next Steps: Dataset

- Document and systematise the corpus
- Make it available to the community as a resource via <http://arise.essex.ac.uk>
- Launch (Phase 1) – June 2019  
Catalyst Project event

# Preliminary Findings

- pre-Sendai 5-year average is a significant determinant of the post-Sendai average
- no evidence supporting the idea that policy similarity affects the average emergency aid received post agreement of the Sendai Framework



|  | Average Emergency Aid<br>Received OECD (2016-2017)<br>(post-Sendai) in US \$ 000s (2016 Constant) |                       |                       |
|--|---|-----------------------|-----------------------|
|  |   | <1000                 | <400                  |
| Policy Similarity Score (0-1)  | -227.1<br>(-200.2)  | -5.572<br>(-29.01)    | -2.792<br>(-16.52)    |
| Average Emergency Aid Received<br>OECD (2010-2014) (pre-Sendai)            | 3.105***<br>(-0.411)  | 0.706***<br>(-0.0681) | 0.518***<br>(-0.0425) |
| Constant   | 89.6<br>(-121.5)  | 23.59<br>(-17.47)     | 16.76*<br>(-9.939)    |
| Observations (count)   | 147   | 144                   | 140                   |
| R-squared  | 0.291   | 0.433                 | 0.521                 |
| Standard errors in parentheses<br>Note that *** p<0.01, ** p<0.05, * p<0.1 |   |                       |                       |

Table 7. Linear Regression of Average Emergency Aid Received OECD (2016-2017) (post-Sendai) [dependent variable], policy Similarity Score (0-1) and Average Emergency Aid Received OECD (2010-2014) (pre-Sendai)

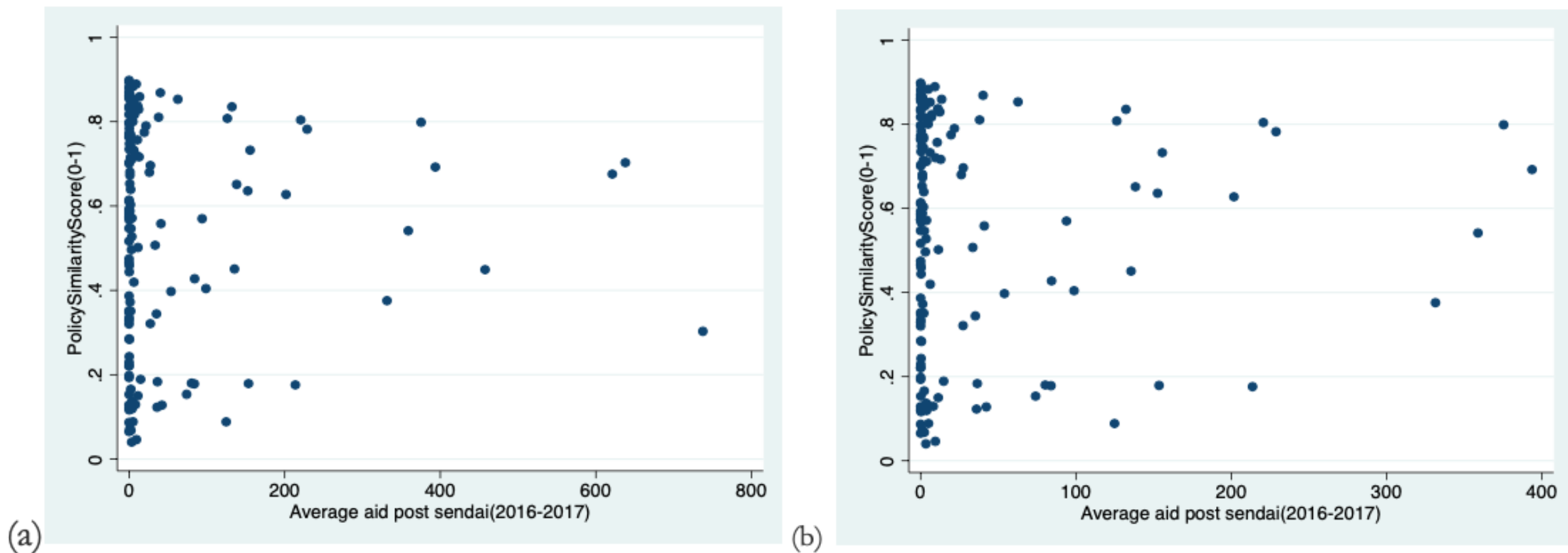


Figure 4. Scatterplot of Linear Regression in Table 7 for Average Emergency Aid Received post-Sendai (2016-2017) in US \$ 000s (2016 constant) less than 1000 (a) and less than 400 (b). Source: OECD data.

# Preliminary Findings

- pre-policy 5-year average is a significant determinant of the post-policy average
- no evidence supporting the idea that policy similarity affects the number of people affected or the number of people that have lost their lives at a disaster event

|  | Average number of people dying as a result of a disaster, 5 year after the resilience policy publication year |          |          |
|--|---|----------|----------|
|  |   | <1000    | <400     |
| Policy Similarity Score (0-1)  | 895   | 100.8    | 150.8    |
|  | (-871.9)  | (-160.1) | (-149.9) |
| Average number of people dead as a result of a disaster, 5 year after the resilience policy publication year | 1.594***  | 1.330*** | 3.021*** |
|  | (-0.539)  | (-0.285) | (-0.848) |
| Constant   | -371  | -17.73   | -75.32   |
|  | (-540)  | (-103.7) | (-98.96) |
| Observations (count)   | 188   | 103      | 99       |
| R-squared  | 0.051   | 0.18     | 0.12     |
| Standard errors in parentheses   |   |          |          |
| Note that *** p<0.01, ** p<0.05, * p<0.1   |   |          |          |

Table 8. Simple Regression Coefficients for 5-year average numbers of deaths less than 1000 and 400 respectively and reports published after 2010, post (dependent) and pre (independent) policy publication year. Source: EM-DAT Data



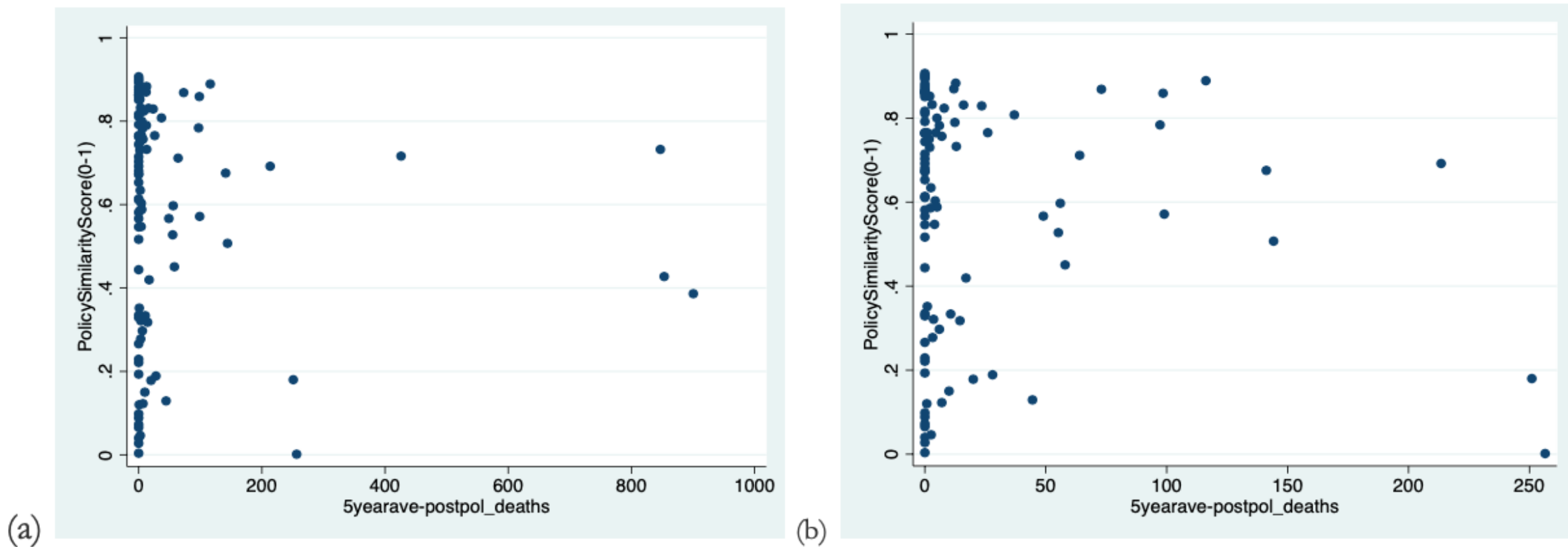


Figure 5. Scatterplot of Policy Proximity score and 5-year average post policy publication of number of deaths, for reports published after 2010 and death averages less than 1000<sup>5</sup> (a) and 400<sup>6</sup> (b) respectively. Source: EM-DAT data.

|  |   |
|--|---|
|  | average population (count) affected 5 years before the resilience policy publication year |
| Policy Similarity Score (0-1)  | -328,697  |
|  | (-373621)   |
| average number of populations affected 5 years before the resilience policy publication year | 0.410***  |
|  | (-0.0122)   |
| Constant   | 347,420   |
|  | (-230817)   |
| Observations   | 188   |
| R-squared  | 0.86  |
| Standard errors in parentheses   |   |
| *** p<0.01, ** p<0.05, * p<0.1   |   |

Table 9. Linear Regression of average number of population affected 5 years before the resilience policy publication year over policy proximity score and average number of population affected 5 years before the resilience policy publication year

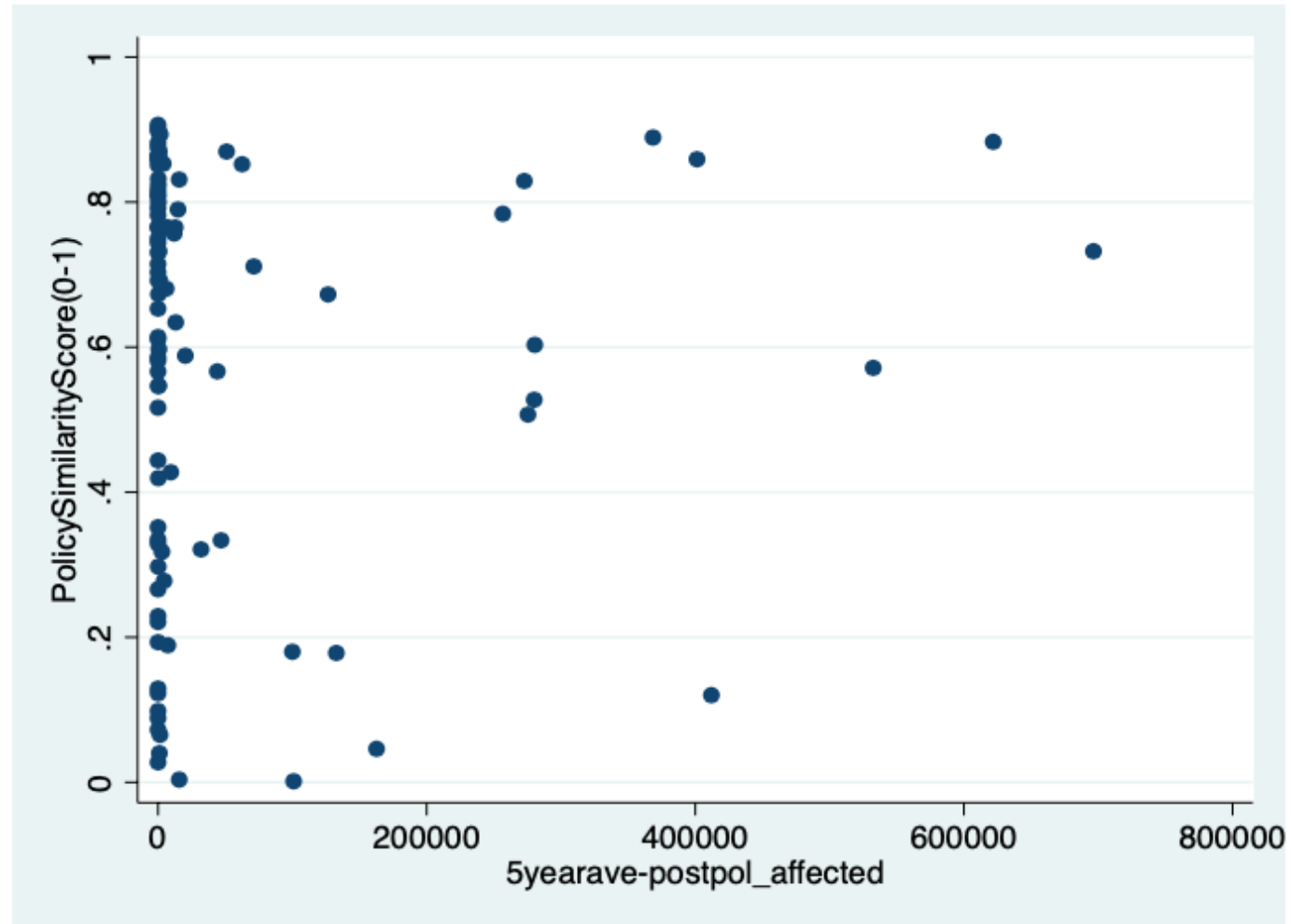
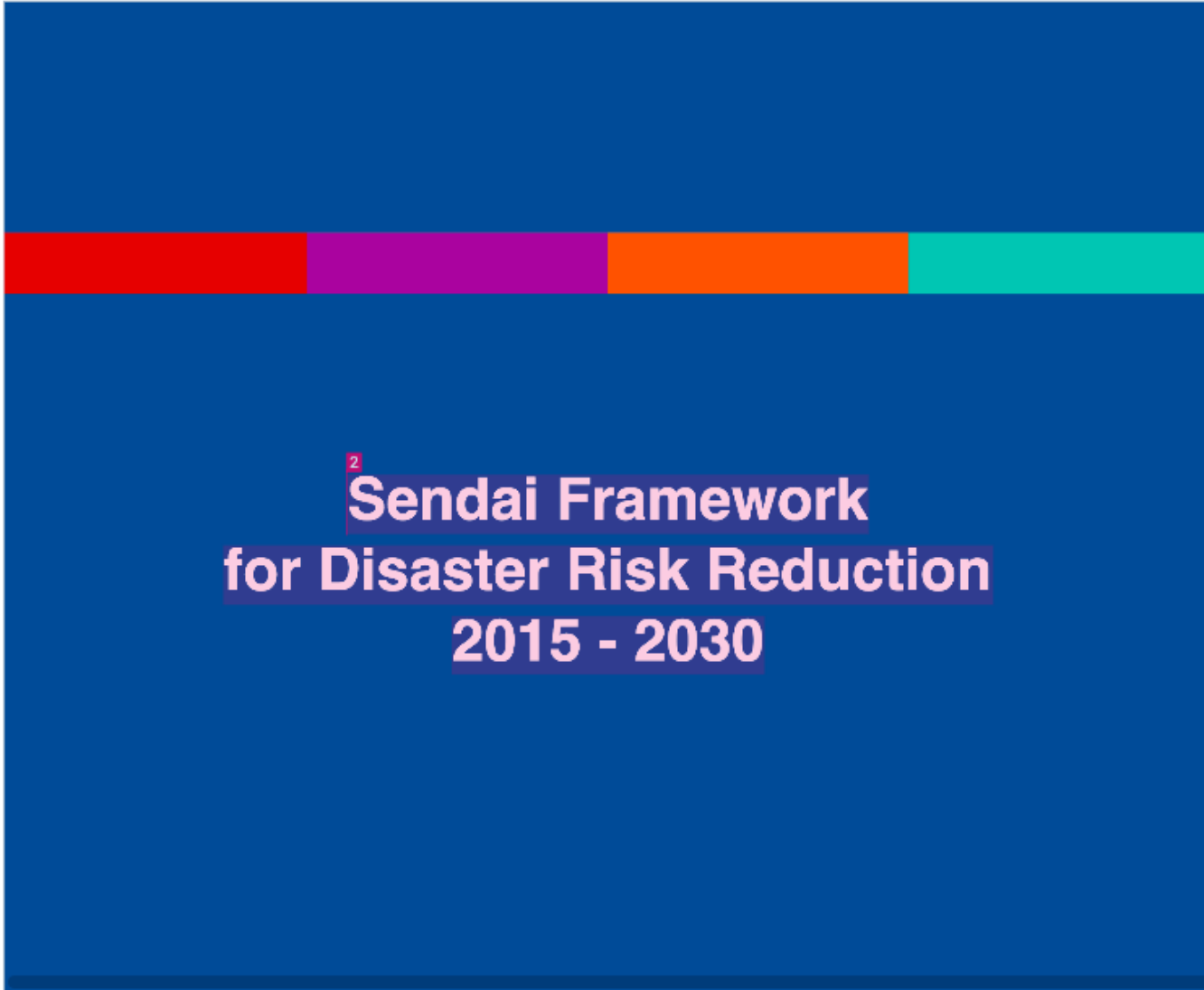


Figure 6. Scatterplot of Policy Proximity score and 5-year average post policy publication of number of people affected, for reports published after 2010 and population affected averages less than 1000000.<sup>7</sup>



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| 1 | <a href="http://www.unisdr.org">www.unisdr.org</a><br>Internet Source                   | 78% |
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through international, regional, subregional, transboundary and bilateral cooperation. The reduction of disaster risk is a common concern for all States and the extent to which developing countries are able to effectively enhance and implement national disaster risk reduction policies and measures in the context of their respective circumstances and capabilities can be further enhanced through the provision of sustainable international cooperation;

- (b) Disaster risk reduction requires that responsibilities be shared by central Governments and relevant national authorities, sectors and stakeholders, as appropriate to their national circumstances and systems of governance;
- (c) Managing the risk of disasters is aimed at protecting persons and their property, health, livelihoods and productive assets, as well as cultural and environmental assets, while promoting and protecting all human rights, including the right to development;
- (c) Disaster risk reduction requires an all-of-society engagement and partnership. It also requires empowerment and inclusive, accessible and non discriminatory participation, paying special attention to people disproportionately affected by disasters, especially the poorest. A gender, age, disability and cultural perspective should be integrated in all policies and practices, and women and youth leadership should be promoted. In this context, special attention should be paid to the improvement of organized voluntary work of citizens;
- (e) Disaster risk reduction and management depends on coordination mechanisms within and across sectors and with relevant stakeholders at all levels, and it requires the full

< **www.unisdr.org** Internet Source >

regated data, including by sex, age and disability, as well as on easily accessible, up-to-date, comprehensible, science-based, non-sensitive risk information, complemented by traditional knowledge; **(h) The development, strengthening and implementation of relevant policies, plans, practices and mechanisms need to aim at coherence, as appropriate, across sustainable development and growth, food security, health and safety, climate change and**

science-based, non-sensitive risk information, complemented by traditional knowledge;

- (h) The development, strengthening and implementation of relevant policies, plans, practices and mechanisms need to aim at coherence, as appropriate, across sustainable development and growth, food security, health and safety, climate change and variability, environmental management and disaster risk reduction agendas. Disaster risk reduction is essential to achieve sustainable development;

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**State of Eritrea**  
Ministry of Land, Water and Environment  
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**National Adaptation Programme of Action**

April 2007

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**THE DIS-ASTER MANAGEMENT ACT;201'5**

**ARRANGEMENT OF SECTIONS**

| Section   | Title                                  |
|---|--|
| <b>PART I<br/>PRELIMINARY PROVISJON</b>               |  |
| 1.  | Short title and commencement.          |
| 2.  | Application.                           |
| 3.  | Inti:;rpretation.                      |
| <b>PART II<br/>THE DISASTE, :t-1ANAGEMENT AGENCY)</b> |  |
| 4.  | Establi hme__nt o f the Agency,        |
| 5.  | Functions of the Agency.               |
| 6.  | Powers of the Agency.                  |
| 7.  | Tanzani\DisIJSter Man1lgement Council. |
| 8.  | Functions of Council.                  |
| <b>PART III<br/>ADfyfIN!S'T:RATION OF }t;E AGENCY</b> |  |



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# 1 MINISTRY FOR THE CO-ORDINATION OF ENVIRONMENTAL AFFAIRS (MICOA)

## 2 National Adaptation Programme of Action (NAPA)



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1  
Socialist republic of Vietnam



**NATIONAL STRATEGY FOR  
NATURAL DISASTER  
PREVENTION, RESPONSE AND  
MITIGATION  
TO 2020**

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## A FRAMEWORK FOR MAJOR EMERGENCY MANAGEMENT

A Framework enabling An Garda Síochána, the Health Service Executive and Local Authorities to prepare for and make a co-ordinated response to major emergencies resulting from events such as fires, transport accidents, hazardous substance incidents and severe weather.

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# State of Alabama Emergency Operations Plan



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