

# Building new tools for data sharing and re-use through a transnational investigation of the socio-economic impacts of protected areas (PARSEC).

David Mouillot<sup>1</sup>, Nicolas Mouquet<sup>2</sup>, Shelley Stall<sup>3</sup> and Alison Specht<sup>4\*</sup>

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\*presenter



PARSEC is a project sponsored by the Belmont Forum as part of its Collaborative Research Action (CRA) on Science-Driven e-Infrastructures Innovation (SEI), with funding from FAPESP, the ANR, JST and the NSF, with collaborators from Australia, and support from the synthesis centre CESAB of the French Foundation for Research on Biodiversity.

*We acknowledge the Traditional Owners and Custodians of the land and sea in all nations. We honour their profound connections to land, water, biodiversity and culture and pay our respects to their Elders past, present and emerging.*



## Topics for today

- Introduction to the project
- Data requirements in the Synthesis Strand
- The contribution of the Data Strand
- Challenges and outcomes to date

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Building new tools for data sharing and re-use through a transnational investigation of the socio-economic impacts of protected areas (PARSEC).



### **Unique components:**

- 1. To conduct interdisciplinary, transnational synthesis science (**The Synthesis Strand (A)**) while*
- 2. testing novel approaches to the management and preservation of environmental and socio-economic data (**The Data Science Strand (B)**)*

### **Aim of this combination**

These two strands will learn from each other, with 'domain' scientists better equipped to practice good data management, and data scientists better able to 'speak with' and respond to researcher priorities.

# A. The science question: do Protected Areas help or hinder local communities?

- Benefits: well-being
- Neutral outcomes: food security
- Negative effects

## ANALYSIS

<https://doi.org/10.1038/s41893-019-0306-2>

nature  
sustainability

## Well-being outcomes of marine protected areas

Natalie C. Ban<sup>1\*</sup>, Georgina Grace Gurney<sup>2</sup>, Nadine A. Marshall<sup>3</sup>, Charlotte K. Whitney<sup>1</sup>, Morena Mills<sup>4</sup>, Stefan Gelcich<sup>5</sup>, Nathan J. Bennett<sup>6,7,8</sup>, Mairi C. Meehan<sup>9</sup>, Caroline Butler<sup>10</sup>, Stephen Ban<sup>11</sup>, Tanya C. Tran<sup>1</sup>, Michael E. Cox<sup>12</sup> and Sara Jo Breslow<sup>13</sup>



RESEARCH ARTICLE

## Assessing the Effect of Marine Reserves on Household Food Security in Kenyan Coral Reef Fishing Communities

Emily S. Darling<sup>1,2,a</sup>

<sup>1</sup> Earth to Ocean Research Group, Simon Fraser University, Burnaby, BC, Canada  
<sup>2</sup> Society, Mombasa, Kenya

Science of the Total Environment 763 (2021) 144399

Contents lists available at ScienceDirect

Science of the Total Environment

journal homepage: [www.elsevier.com/locate/scitotenv](http://www.elsevier.com/locate/scitotenv)



Are protected areas good for the human species? Effects of protected areas on rural depopulation in Spain

D. Rodríguez-Rodríguez<sup>a,b,\*</sup>, R. Larrubia<sup>a</sup>, J.D. Sinoga<sup>a</sup>



## Accelerated Human Population Growth at Protected Area Edges

George Wittemyer,<sup>\*,†</sup> Paul Eisen, William T. Bean, A. Coleman O. Burton, Justin S. Brashares<sup>†</sup>

Protected areas (PAs) have long been criticized as creations of and for an elite few, where associated costs, but few benefits, are borne by marginalized rural communities. Contrary to predictions of this argument, we found that average human population growth rates on the borders of 306 PAs in 45 countries in Africa and Latin America were nearly double average rural growth, suggesting that PAs attract, rather than repel, human settlement. Higher population growth on PA edges is evident across ecoregions, countries, and continents and is correlated positively with international donor investment in national conservation programs and an index of park-related funding. These findings provide insight on the value of PAs for local people, but also highlight a looming threat to PA effectiveness and biodiversity conservation.

[www.sciencemag.org](http://www.sciencemag.org) SCIENCE VOL 321 4 JULY 2008

## B. How can e-infrastructures innovation enhance cross-disciplinary data use?

How can the researcher/domain expert benefit from new data science innovation and embed it in their practice

- Through providing exemplars?
- Provide educational packages?
- Create rewards for data sharing and re-use?
- A combination of the above? or other...



# PARSEC : Building New Tools for Data Sharing and Reuse through a Transnational Investigation of the Socioeconomic Impacts of Protected Areas

Consortium Leaders: Nicolas Mouquet, David Mouillot, Alison Specht and Shelley Stall.



<http://parsecproject.org>

## Objectives

- (a) Predict the socioeconomic outcomes of natural protected areas (PAs) on rural communities using a novel combination of satellite imagery and artificial intelligence;
- (b) Determine the influence of PAs on consumption expenditure and asset health of rural communities;

- (c) Improve future environmental decision-making;
- (d) Improve digital connections between researchers, their funding, publications and data;
- (e) Improve recommendations for the research data workflow and skills for research teams;

- (f) Increase the number of citations to data sets and better attribute them to the data creator;
- (g) Promote credit for open and FAIR data management and preservation for data reuse;
- (h) Provide tools for researchers to view how the data they have deposited is used and cited.

### Synthesis-science strand (David Mouillot)

**WP1:** Stratified sampling of 200 rural communities close to and far from natural protected areas (PAs) using matching algorithms.

**WP3:** Using paired comparison tests determine whether proximity to a PA can improve socioeconomic outcomes. Identify contributing factors.

**WP2:** Estimate socioeconomic conditions in the selected rural communities using remote sensing and artificial intelligence.

**WP4:** Dissemination (website, data sharing, scientific publications, newsletters, conferences).

### Data-science strand (Shelley Stall)

**WP5:** Develop leading practices, toolkits and workshops to support data sharing.

**WP6:** Improve capability for researchers to view how deposited data has been used, cited and reused (widget, web-accessible researcher profile).

improve data workflow for research teams

**FUNDING:** 1258K€

**Duration:** 48 months

### Participating countries

**BRAZIL:** University of São Paulo - FAPESP (P. Pizzigatti Corrêa) plus postdoc and technical support (FAPESP)

**FRANCE:** Foundation for Research on Biodiversity, University of Toulouse III - ANR (N. Mouquet)

**JAPAN:** National Institute of Information & Communications Technology, Research Institute for Humanity and Nature - JST (Y. Murayama)

**USA:** American Geophysical Union - NSF (S. Stall)

### Cooperating partners

NCI, Australia (L. Wyborn), BGS, UK (H. Glaves)

### Associated organisations

DataCite, ORCID, ESIP, RDA, EDI, WDS, AST, JWP, TNC





# Initial perceived challenges

- (1) Access to suitable data
- (2) Blending data of different scales and types
- (3) Working together across large geographic boundaries
- (4) Ensuring data management is to international standards

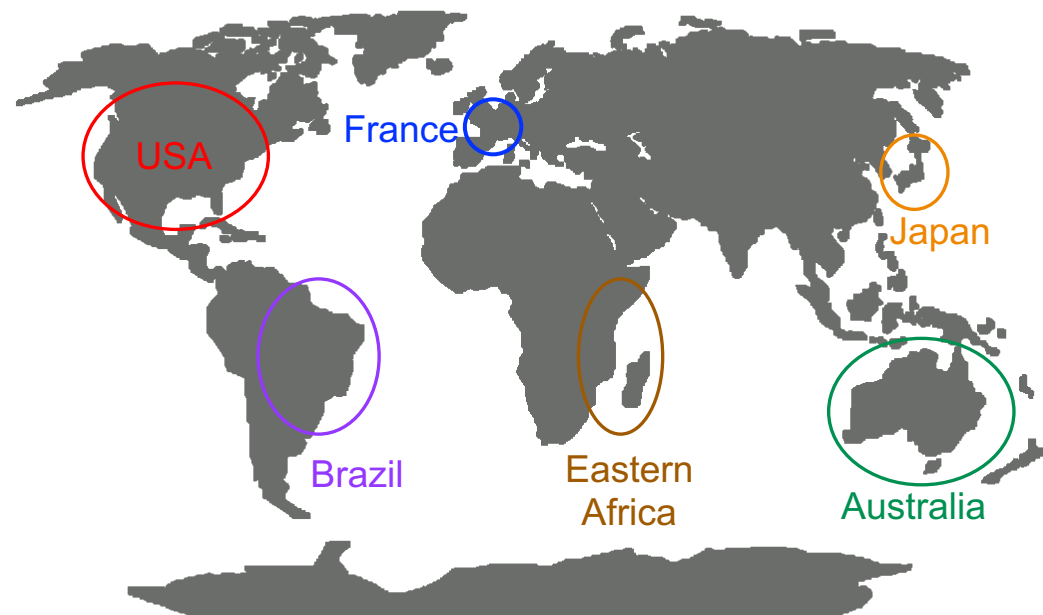


[www.parsecproject.org](http://www.parsecproject.org)

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# Do Protected Areas help or hinder local communities?

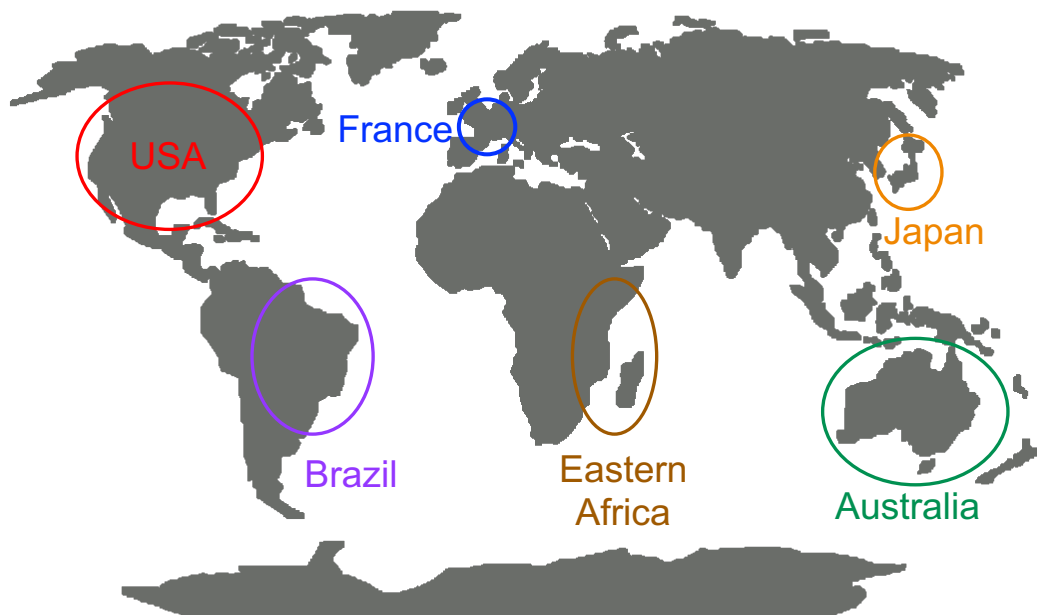


6 regions across the world (HDI gradient)

## Common approach

- Selection of PAs (marine and terrestrial)
- Selection of rural towns and villages
- Long time-series (BACI)
- Matching algorithm

# Do Protected Areas help or hinder local communities?



6 regions across the world (HDI gradient)

## Common approach

- Selection of PAs (marine and terrestrial)
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## Different assessments

- Socioeconomic outcomes
- Observed (census, DHS) versus inferred (remote sensing) data

# The two pillars of the synthesis strand

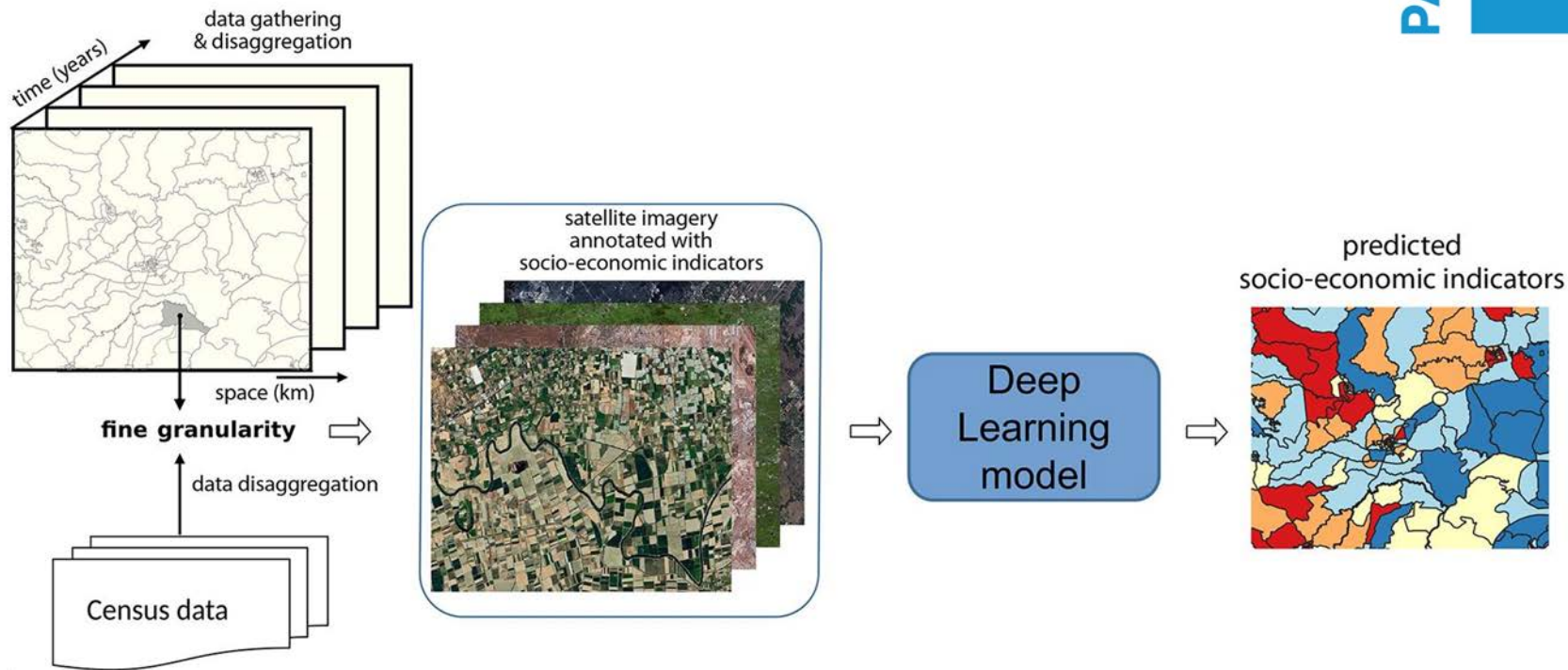
Selection of  
protected areas (PA),  
adjacent settlements  
and mirror sites



Model the socio-  
economic outcomes  
of the effects of  
creation of PAs on  
those settlements  
using remote  
sensing and AI

**Inspired by:** Jean et al. 2016. Science 353, 790–794. doi: 10.1126/science.aaf7894  
Yeh et al. 2020. Nat Commun 11, 2583. doi: 10.1038/s41467-020-16185-w *et al.*

# The workflow



# Data requirements

- Time series data
- Documentation of protected areas across the world
  - Source: World Database for Protected Areas – collected from each country and aggregated in the UK. Ideally this would present a good comparison between countries.
- Remote sensing
  - Source: various. Around villages/townships proximal to a PA, before and after its creation, and similar for reference sites remote from a PA.
- Socio-economic data
  - Source: household (census) data in each country (globally Demographic and Health Surveys (DHS) etc)

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Repositories...  
FAIR Data...  
Preservation...  
Rich Metadata...  
OK? Got it?



**Data Science  
Strand Team Members**

## Data strand

Stall, Shelley. (2021, June). PARSEC: A FAIR Data Use Case with 40 Researchers, 6 Countries, and one Data Management Plan. Presented at the Sustainability Research & Innovation Congress 2021 (SRI2021), Brisbane, Australia: Zenodo. <http://doi.org/10.5281/zenodo.4978466>

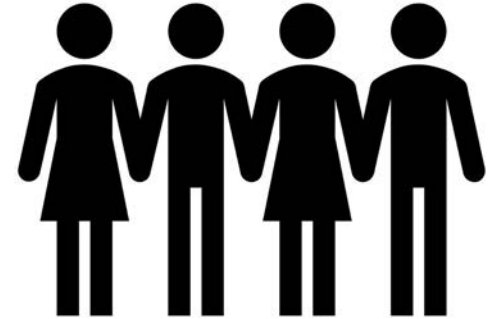
Repositories...  
FAIR Data...  
Preservation...  
Rich Metadata...  
OK? Got it?



**Data Science  
Strand Team Members**

## Data strand

Um...  
Not Sure What You  
Mean.



**Synthesis Science  
Strand Team Members**

Stall, Shelley. (2021, June). PARSEC: A FAIR Data Use Case with 40 Researchers, 6 Countries, and one Data Management Plan. Presented at the Sustainability Research & Innovation Congress 2021 (SRI2021), Brisbane, Australia: Zenodo. <http://doi.org/10.5281/zenodo.4978466>

Listening to the researchers, and ensuring **data management** is to international standards...



- **Access** for all team members from all countries
- **Access/Control** to protect project information
- **Version control** of changes
- **Automated backups** to ensure no loss of data
- Ability to handle a range of **file sizes**
- Ability to honour **terms of use** for datasets/imagery
- Ability to limit/track access to files with **personal information/sensitive data**
- **Integrate with platforms** used by the project
- **Persistent** after the project

# Implementation of support for a research project guided by the Belmont DDOMP\*

\*Bishop et al. 2020. Data Curation Profiling to Assess Data Management Training Needs and Practices to Inform a Toolkit. Data Science Journal 19, 4. <https://doi.org/10.5334/dsj-2020-004>  
Stall et al. 2021. PARSEC DDOMP Workbook Checklist. Zenodo. <https://doi.org/10.5281/zenodo.4909852>  
Stall et al. 2021. PARSEC Data and Digital Output Management Plan and Workbook. Zenodo.  
<https://doi.org/10.5281/zenodo.4910115>

# Tools (the PARSEC selection) : DDOMP





## Material development and temporary storage

- + Google Drive 


## Team communications and information decimation

- + Email, Slack  

## Short-term Dataset storage (during project)

- + Open Science Framework (integrated with AWS)  OSF 

## Data preservation (including derived products) in a CoreTrustSeal repository

- + Environmental Data Initiative 

## References

- + Zotero 

## Software development

- + GitHub 

## Software preservation

- + Zenodo (integrated with GitHub) 

## Training, workshop material preservation

- + Zenodo 

## Credit and automated attribution

- + Up-to-date ORCID 

## Acknowledgments

“This work is part of the **Building New Tools for Data Sharing and Re-use through a Transnational Investigation of the Socioeconomic Impacts of Protected Areas (PARSEC)** project with funding provided by the Belmont Forum < through country Grant ##### >.”

# Guidelines to support the research career\*

\*Stall et al. 2021. Digital Presence Checklist. Zenodo. <https://doi.org/10.5281/zenodo.5520043>

# Creating a timeline for the researcher

## Once (during lifetime of researcher)

- ☐ **ORCID profile**
- + Activate the automatic updates from Crossref (published papers) and DataCite (published datasets and other digital objects).
- + More info: [http://bit.ly/ORCID\\_Trust](http://bit.ly/ORCID_Trust)



## Monthly

- ☐ Publish and Report **conference presentations** and **posters**
- ☐ **Deposit and preserve**
  - ☐ Datasets
  - ☐ Software
- for peer-reviewed papers and supporting digital objects
- ☐ Report **publications with citations to datasets, software, and other digital objects**

## Weekly

- ☐ Track
  - ☐ **datasets** created,
  - ☐ **datasets** used,
  - ☐ **workflow/provenance**



## Quarterly

- ☐ Update your ORCID profile
- + Ensure accurate and complete to ensure proper credit



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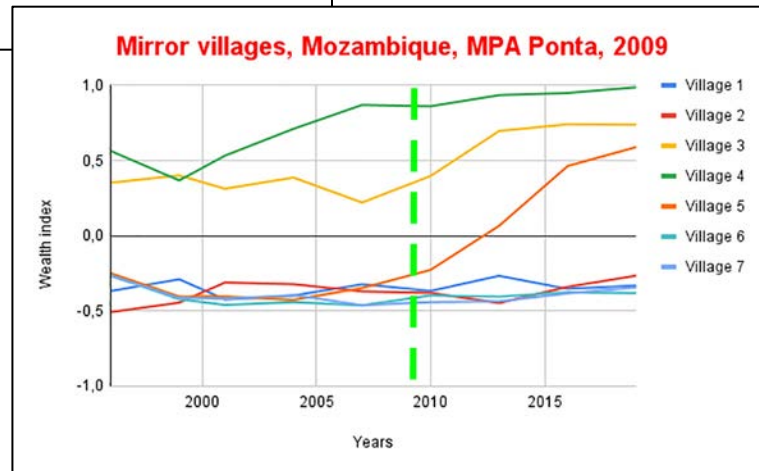
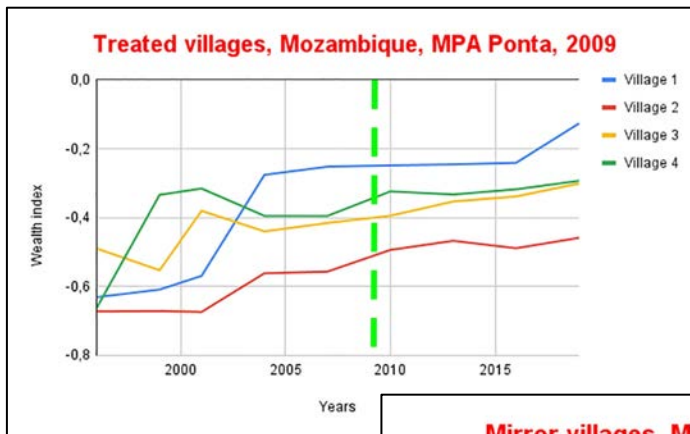


# Challenges

- Collaboration
  - Languages, time zones, disciplinary approach, availability of expertise
  - Lag in development of common goal, relationships and trust due to covid19
- Data availability
  - Global sources not fit for purpose, e.g. WDPA has many translation errors (year of creation, IUCN category, etc)
  - PA classifications and nomenclature varies between countries
  - DHS / HDI data are not systematic in time or across countries. -> need to find alternatives
- Analysis
  - Difficulty with comparative baselines in each country
  - Correlation, not causality

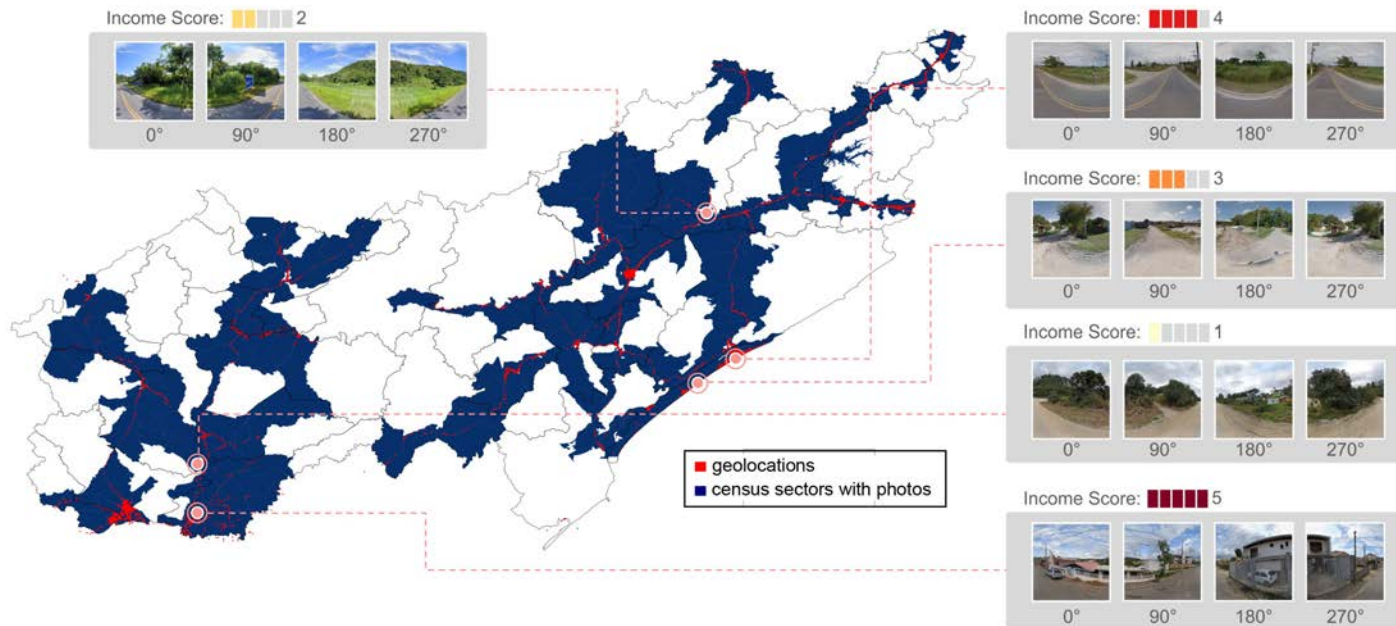
# Outcomes: the east African case study

- Selection of PA's, affected villages and mirror sites
- Ground truthing poverty/wealth index using DHS data
- Deep learning and earth observation data to estimate wealth/poverty index

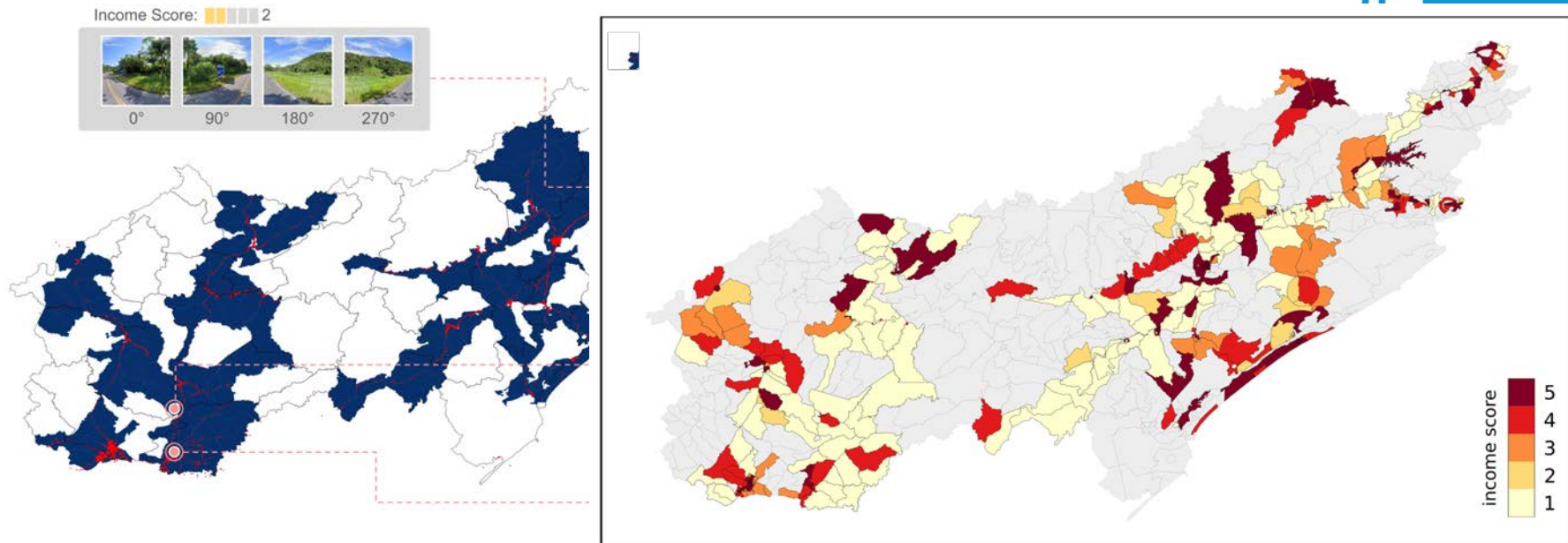


# Outcomes: the Val do Ribeira case study

- census data in Brazil (IBGE, DHS not suitable)
- using a CNN to predict socio-economic indicators from Google Street View images

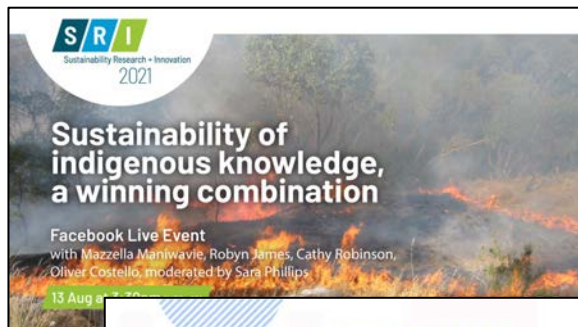


# Outcomes: the Val do Ribeira case study



Machicao, J., et al. 2022. A Deep-Learning Method for the Prediction of Socio-Economic Indicators from Street-View Imagery Using a Case Study from Brazil. Data Science Journal 21, 6.  
<https://doi.org/10.5334/dsj-2022-006>

# Outputs



**II Simpósio do Centro de Saúde Global (CSG) UNIFESP**

**Interação Saúde e Meio Ambiente**

29 de junho de 2021  
9:00 - 17:00 h

Inscrições: SIEX  
<https://sistemas.unifesp.br/jaca/di/procc-siex/index.php?page=INS&acao=2&code=20136>

Transmissão: Youtube  
<https://www.youtube.com/watch?v=ve5FogRaBds>

UNIFESP  
Agência de Inovação Tecnológica e Social

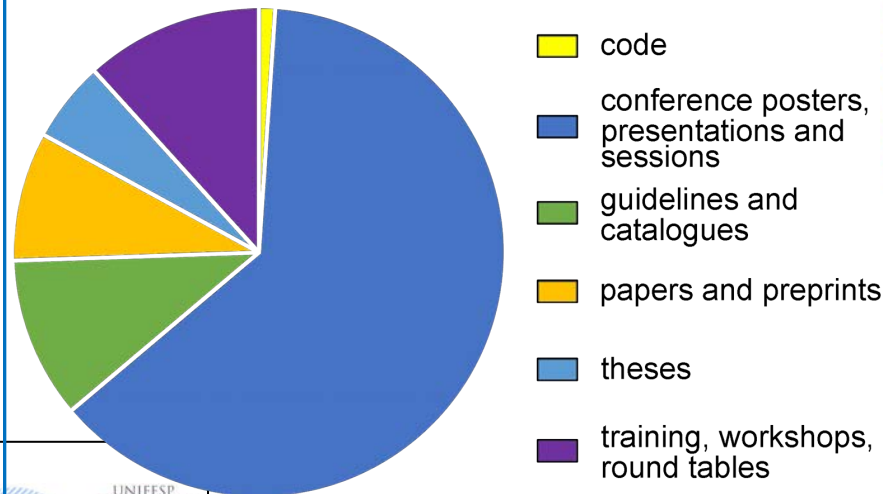


David, R, et al. 2020. FAIRness Literacy: The Achilles' Heel of Applying FAIR Principles. *Data Science Journal*, 19: 32, pp.1-11. DOI: <https://doi.org/10.5334/dsj-2020-032>

## PRACTICE PAPER

### FAIRness Literacy: The Achilles' Heel of Applying FAIR Principles

Romain David<sup>1,2</sup>, Laurence Mabile<sup>3</sup>, Alison Specht<sup>4</sup>, Sarah Stryeck<sup>5</sup>, Mogens Thomsen<sup>3</sup>, Mohamed Yahia<sup>6</sup>, Clement Jonquet<sup>7</sup>, Laurent Dollé<sup>8</sup>, Daniel Jacob<sup>9</sup>, Daniele Bailo<sup>10</sup>, Elena Bravo<sup>11</sup>, Sophie Gachet<sup>12</sup>, Hannah



PARSEC



**COMMITTEE ON DATA**

**CODATA**

**A Deep-Learning Method for the Prediction of Socio-Economic Indicators from Street-View Imagery Using a Case Study from Brazil**

RESEARCH PAPER

JEANETH MACHICAO ●  
ALISON SPECHT ●  
DANTON VELLENIH ●  
LEANDRO MENEGUZZI ●  
ROMAIN DAVID ●

SHELLEY STALL ●  
KATIA FERRAZ ●  
LAURENCE MABILE ●  
MARGARET O'BRIEN ●  
PEDRO CORRÊA ●

**u[ubiquity press**

\*Author affiliations can be found in the back matter of this article





**Repository Guidelines**



### Types of Repository

Most repositories fall into one of two main categories: domain or generalist. Most of what follows on repository selection focusses more heavily on domain repositories, since they are more specialist, and thus more likely to fulfil both the common functions you would want from a repository, as well as any specific needs you may have within your research field(s).

#### Domain Repositories

A domain repository—sometimes known as a ‘subject-based’ repository—will specialize in a specific research field or data type. It usually has a well-defined group of users at which its data and services are aimed, its ‘Designated Community’. In many cases, domain repositories have a national or regional remit, or at least are publicly funded, and thus you will be able to deposit your data (and access others data) free of charge. They may also be part of a wider network of similar national repositories or be subject to international agreements regarding data sharing and management, which can ensure a wider pool of expertise and guarantees that multiple mirrored copies of your data exist.

#### Generalist Repositories

A generalist repository is a generic, multi-subject repository. Typical examples include institutional repositories serving research performing organizations such as a university library, open access repositories such as Zenodo or Dryad, and technical service providers such as Figshare. The user community of a generalist repository will be very broad and may even be the general public at large. Because of this, and since you may be a (paying) ‘client’ generalist repositories will often rely on data depositors to manage their own data. Many do not offer services beyond simple archiving—static, long-term preservation—although an institutional repository (or a paid service contract) may include curation expertise to help with (for instance) basic metadata.

#### Benefits of Storing Research Data in a Repository

There are many advantages to you as both a data producer and data user if you and your peers choose to preserve data in a repository. Of course, not all repositories are created equal, and these potential benefits are only realized by selecting a repository that does its job correctly, as described in the next section.

If you are a...

Data Producer/Depositor	Data User
<ul style="list-style-type: none"> <li>✓ Your Data Management Plan is fulfilled (i.e., satisfies funders/Open Data requirements).</li> <li>✓ The initial investment of collecting your data is preserved.</li> <li>✓ You have the satisfaction that your data are being stewarded correctly and remain useful and meaningful.</li> <li>✓ Your data are looked after long term, even if the data service discontinues.</li> <li>✓ The ease of discovery of your data is increased.</li> <li>✓ Publication, reuse or repurposing, and citation is facilitated for your data.</li> <li>✓ Recognized expertise is available to assist you with technicalities.</li> <li>✓ It can be ensured that any necessary/wanted conditions on access and use, as well as licensing, are adhered to. (N.B. This is especially important for sensitive data.)</li> </ul>	<ul style="list-style-type: none"> <li>✓ You can easily discover data.</li> <li>✓ You can easily understand your access and usage rights</li> <li>✓ You can reuse/repurpose data without the costs of collection/production.</li> <li>✓ You can verify (and thus build on) others results, accelerating scientific knowledge.</li> <li>✓ You can cite peers, knowing that the data will still exist into the future.</li> <li>✓ You have the satisfaction that the data are original/uncompromised, and that any changes are recorded (provenance).</li> <li>✓ (Re)Use of the data is made easier through full/appropriate metadata in an international or community standard.</li> <li>✓ Ability to give feedback to the data producer/holder.</li> </ul>









The PARSEC Data Strand has been actively creating guidelines, toolkits and a series of seminars and workshops to help users across all aspects of the research data lifecycle, including vocabularies



## MANAGE YOUR DIGITAL OBJECTS – RESEARCH TEAM MEMBER CHECKLIST

Establishing common team resources and a schedule for digital object management during a project will ease the burden of documentation and preservation – streamlining your publications.

### ESTABLISH AND USE A COMMON SET OF TEAM RESOURCES.

- ☐ Before or near the start of the project, make decisions on what resources the team will use to:
  - ☐ Communicate and disseminate information. e.g., Slack channel, email
  - ☐ Develop and manage documents during the project. e.g., Google Drive
  - ☐ Store datasets during the project, considering size and access/controls. e.g., OSF, <https://osf.io>, an institutional repository

## DIGITAL PRESENCE CHECKLIST

Connect your research to your data, software, institution, and more. Use this checklist to optimize your digital presence, increase discovery of your work to potential collaborators and partners, and receive credit when others use your work.

### YOU. YOUR ORCID.

- ☐ **Have your own ORCID.** It provides a persistent digital identifier that distinguishes you from other researchers and supports automated linkages between you and your research activities. Go here to register: <https://orcid.org>, and select “For Researchers”.
- ☐ **Include your ORCID on all scholarly work.** This includes your publications, datasets, software, presentations, posters, signature block of your emails. Everything. This helps with linking to your ORCID profile.
- ☐ **Keep your ORCID profile current.**
  - ☐ Enable automatic updates from Crossref and DataCite. [AGU Digital Presence blog post](#) has the detailed steps.
  - ☐ Set a reminder every three months to ensure all your work is connected and current in your ORCID profile. Make sure your current affiliation and email are included and public for viewing. Add a second email (which can be private) to ensure account access should one become locked.

### YOUR PUBLICATIONS. THE DIGITAL OBJECT IDENTIFIER (DOI) + YOUR ORCID.

- ☐ **Include your ORCID as well as your co-authors ORCID on your publications.**
  - ☐ When given a choice, use journals that require your ORCID as well as your co-authors. In this way your paper will be registered along with your ORCID and automatically linked.
  - ☐ If your selected journal does not require ORCIDs, include it anyway. Place your ORCID as close to your name as possible. Also include the ORCIDs of your co-authors.

### YOUR DATASETS. DOIS / PERSISTENT IDENTIFIERS (PIDs) + YOUR ORCID.

- ☐ **Select a repository that supports discovery and preferably is specific to your data type** (e.g., Domain /Discipline Repository).

<https://zenodo.org/communities/parsec/?page=1&size=20>

## Publication Year

<input type="checkbox"/> 2022	22
<input type="checkbox"/> 2021	63
<input type="checkbox"/> 2020	30
<input type="checkbox"/> 2019	51
<input type="checkbox"/> 2018	32
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<input type="checkbox"/> 2015	12
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<input type="checkbox"/> 2011	18
<input type="checkbox"/> 2010	12

## Work Type

<input type="checkbox"/> Text	199
<input type="checkbox"/> Dataset	109
<input type="checkbox"/> Journal Article	96
<input type="checkbox"/> Collection	41

## 454 Works

### Data from: Phylogenetic signal in module composition and species connectivity in compartmentalized host-parasite networks

Boris R. Krasnov, Miguel A. Fortuna, David Mouillot, Irina S. Khokhlova, Georgy I. Shenbrot & Robert Poulin

Version 1 of Dataset published 2011 in [DRYAD](#)

Across different taxa, networks of mutualistic or antagonistic interactions show consistent architecture. Most networks are modular, with modules being distinct species subsets connected mainly with each other and having few connections to other modules. We investigate the phylogenetic relatedness of species within modules and whether a phylogenetic signal is detectable in the within- and among module connectivity of species using 27 mammal-flea networks from the Palaearctic. In the 24 networks that were modular, closely-related hosts co-occurred in the same module more often than expected by chance; in contrast, this was rarely the case for parasites. The within- and among-module connectivity of the same host or parasite species varied geographically. However, among-module but not within-module connectivity of host and parasites was somewhat phylogenetically constrained. These findings suggest that the establishment of host-parasite networks results from the interplay between phylogenetic influences acting mostly on hosts and local factors acting on parasites, to create an asymmetrically constrained pattern of geographic variation in modular structure. Modularity in host-parasite networks seems to result from the shared evolutionary history of hosts and by trait convergence among unrelated parasites. This suggests profound differences between hosts and parasites in the establishment and functioning of bipartite antagonistic networks.

DOI registered November 29, 2011 via DataCite.



👤 1 Citation    👁 139 Views    📄 39 Downloads

[Dataset](#)

[English](#)



# Desired outcome:

not only a good scientific product but also  
a workflow and product that is transparent, open, and reproducible



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Inter-University Research Institute Corporation  
National Institutes for the Humanities  
**Research Institute for  
Humanity and Nature**



**TOKYO  
METROPOLITAN  
UNIVERSITY**



**USP**



**ORCID**

**erinha**

European Research Infrastructure  
on Highly Pathogenic Agents



**AGU100** ADVANCING  
EARTH AND  
SPACE SCIENCE

**BELMONT  
FORUM**

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