



A guide to

# Prioritising open data to drive global development

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## Executive summary

Open data can be released and used to support sustainable global development in countless ways. Here we provide a **tool for prioritising which open data to release to address challenges** across six sectors: **education, health, transportation, environment, sanitation and waste, and governance**. The resource is available as a [Google spreadsheet, on the web](#) and as a [download](#).

By 2014 there were already over 3 billion internet users worldwide, two-thirds of whom were based in developing countries.<sup>1</sup> Mobile-cellular penetration is even more pervasive; in developing countries it is estimated at 90% (69% in Africa).<sup>2</sup> Within this context, open data and e-governance have emerged as global trends. Over 46 countries and 200 states, regions or cities have introduced formal open data programmes.<sup>3</sup>

Here we highlight how governments apply open data around the world to help promote sustainable development. For each sector, we map out relevant datasets and examples of real-world open data application and tools. We then offer a starting point and a menu of options to help policy-makers choose datasets to release as open data.

We selected the datasets based on a rigorous, multi-method methodology, in which we collected more than 100 use-cases. In mapping key datasets against the six sectors, we found that **open spatial data** plays a central role in global development. This includes maps along with geocoded locations of sector-specific facilities such as schools or healthcare providers. For example, in Kenya, 'Find My School'<sup>4,5</sup> uses an interactive map to plot school location data, allowing citizens to find out about nearby schools. Other tools focus on transportation, helping citizens to avoid congestion and save time.

Other key open datasets focus on **budgets, spending and contracting**. Increasing transparency and accountability in governance can lead to higher citizen engagement and improved efficiency in government spending. An example is BudgiT<sup>6</sup> in Nigeria, which enables access to governance and budget information for 174 million citizens in Africa's largest economy.<sup>7</sup>

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<sup>1</sup> International Telecommunication Union (2014) *The World in 2014: ICT facts and figures*, Statistics Division Telecommunication Development Bureau ITU. Available at

<http://www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2014-e.pdf>, accessed on 2014-12-20

<sup>2</sup> Ibid.

<sup>3</sup> Data.gov, *Open Government*, <https://www.data.gov/open-gov>, accessed on 2015-01-05

<sup>4</sup> Find My School Kenya, <http://findmyschool.co.ke>, accessed on 2015-01-16

<sup>5</sup> A critical study on the impact of open data in Kenya is: Mutuku, L., & Mahihu, C. (2014) *Understanding the impacts of Kenya open data applications and services*. Open data in developing countries. iHub Research. Available at <http://www.opendataresearch.org/sites/default/files/publications/ODDC%20Report%20iHub.pdf>, accessed on 2015-01-17

<sup>6</sup> BudgiT, <http://www.yourbudgit.com>, accessed on 2015-01-15

<sup>7</sup> *Budget data is widely used*, in Mejabi, O. V., Azeez, A.L., Adedoyin, A. & Oloyede, M. O. (2014) Case Study Report on Investigation of the Use of the Online National Budget of Nigeria. University of Ilorin. Available at <http://www.opendataresearch.org/sites/default/files/publications/Investigation%20of%20Open%20Budget%20Data%20in%20Nigeria-print.pdf>, accessed on 2015-01-17

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There is growing evidence of open data being used in developing countries, as we highlight below. Policy-makers can draw on this to improve and support their open data initiatives to address development challenges.

For additional guidance on how to bring about organisational change to support and sustain open data in the long-term, see the ODI's white paper '*Open data in government: how to bring about change*'.<sup>8</sup>

**Open data is data that anyone can access, use and share.** It supports global development by stimulating business innovation and economic growth, improving transparency and accountability, and increasing efficiencies in government and third sector organisations.

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<sup>8</sup> Open Data Institute (2015) *Open data in government: how to bring about change*, available at <http://theodi.org/open-data-in-government-how-to-bring-about-change>, accessed on 2015-03-03

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## Introduction

This report gives practical guidance to sector leaders and policy-makers on how to use open data to address global development challenges. We offer concrete real-world examples of successful interventions, along with the types of datasets that need to be available for people to replicate them.

Open data can help target aid money and enhance development programmes. It helps track progress, prevent corruption and contributes to innovation, job creation and economic growth. Over 46 countries and over 200 states or regions now have formal open data programmes.<sup>9</sup> An analysis of the latest Open Government Partnership action plans<sup>10</sup> reveals 142 specific open data actions among the 48 member countries that have so far submitted national action plans. While developed countries such as the USA, the UK and France have been early leaders, many developing countries have now also established open data programmes, including Brazil,<sup>11</sup> Burkina Faso,<sup>12</sup> Ghana,<sup>13</sup> Indonesia,<sup>14</sup> Kenya<sup>15</sup> and Moldova.<sup>16</sup> Other countries, despite not having a formal programme, have made some of their data available.

Specialists in some sectors are establishing international policy and technical standards – including open budgets,<sup>17</sup> aid transparency,<sup>18</sup> extractives transparency<sup>19</sup> and open contracting<sup>20</sup> – as well as overall assessments of national performance including the Open Data Index<sup>21</sup> and the Open Data Barometer.<sup>22</sup>

While these are positive steps, achieving real impact depends on releasing the right data and turning that data into useful services or civic action. Many open data programmes have underperformed because either or both of these factors are missing or underdeveloped. For example, the Open Data Barometer points to “one sided [open data] initiatives [...] where government action to publish selected datasets is not matched by civil society capacity and freedom to engage with the data, nor by private sector involvement in the open data process”.

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<sup>9</sup> Data.gov, *Open Government*, <https://www.data.gov/open-gov>, accessed on 2015-01-05

<sup>10</sup> Open Government Partnership action plans, <http://goo.gl/hwXobK>, accessed on 2015-01-05

<sup>11</sup> Portal Brasileiro de Dados Abertos, <http://dados.gov.br>, accessed on 2015-01-14

<sup>12</sup> Open Data Burkina Faso, <http://data.gov.bf>, accessed on 2015-01-14

<sup>13</sup> Data Portal Ghana, <http://data.gov.gh>, accessed on 2015-01-14

<sup>14</sup> Data Portal Indonesia, <http://data.go.id>, accessed on 2015-01-14

<sup>15</sup> Kenya Open Data, <https://www.opendata.go.ke>, accessed on 2015-01-14

<sup>16</sup> Portalul Guvernamental al Datelor Deschise, <http://www.date.gov.md>, accessed on 2015-01-14

<sup>17</sup> Open Budget Survey, *The Open Budget Index*, <http://survey.internationalbudget.org/#rankings>, accessed on 2015-01-05

<sup>18</sup> International Aid Transparency Initiative, <http://www.aidtransparency.net>, accessed on 2015-01-05

<sup>19</sup> Extractive Industries Transparency Initiative, <https://eiti.org>, accessed on 2015-01-05

<sup>20</sup> Open Contracting Data Standard, <http://standard.open-contracting.org>, accessed on 2015-01-05

<sup>21</sup> Open Knowledge, *Global Open Data Index*, <http://index.okfn.org>, accessed on 2015-01-05

<sup>22</sup> Open Data Research Network (2013) *Open Data Barometer 2013 global report*, available at <http://www.opendataresearch.org/barometer>, accessed on 2015-01-05

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However, when used as part of a structured intervention, open data can be very powerful. For example:

- A programme to improve healthcare through a combination of quantitative data on performance and community participation helped to **reduce infant mortality in rural Uganda by around one third**, whereas stimulating similar participation without performance data had little impact on health workers' behaviour or the quality of healthcare<sup>23</sup>
- Training journalists in the use of data raised awareness and prompted **official action on sanitation in Kenyan schools**, although the data itself had already been in public view<sup>24</sup>
- Check-My-School in the Philippines has used official data, crowd-sourced verification and community monitoring to **increase transparency and social accountability in the Philippine education sector** by tracking the provision of services in public schools<sup>25</sup>

Open data has the best impact when applied as part of a process to achieve change. The use cases in this paper show some of the ways in which this works. These include:

- empowering individuals and communities to press local providers for improvements in their local public services
- improving the transparency and accountability of officials and service providers throughout the delivery chain, and therefore putting more pressure on each of them to improve
- improving the efficiency of markets and providing a greater balance of economic power between suppliers, middlemen and consumers

Sector specialists often find it difficult to see the relevance of open data to their area. One purpose of this report is to invert this view. By taking development sectors as a starting point, we provide a basis for policy- and decision-makers to navigate the landscape of data in their own sectors that can help address their goals. We cover:

- **Relevant experiences of others**, not as examples to be precisely copied, but as a toolkit of possible interventions for designing new projects in specific development situations.

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<sup>23</sup> World Bank (2014) *Information is power: experimental evidence on the long-run impact of community based monitoring, Volume 1*, available at <http://go.worldbank.org/BKF1LUKR20>, accessed on 2015-01-05

<sup>24</sup> Butler, P. (2012) Data "bootcamp" helps Kenyan reporter expose school sanitation woes. *International Center for Journalists*, available at <http://www.icfj.org/news/data-%E2%80%9Cboot-camp%E2%80%9D-helps-kenyan-reporter-expose-school-sanitation-woes>, accessed on 2015-01-05

<sup>25</sup> World Bank (2013) *Philippines: Check-My-School: Monitoring made easy with dedicated volunteers and ICT tools*, available at <http://www.worldbank.org/en/news/feature/2013/02/06/check-my-school-monitoring-made-easy-with-dedicated-volunteers-and-ict-tools>, accessed on 2015-01-05

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- **The precise types of sector-specific data that can lead to results.** To be actionable, the data used needs to be relevant and sufficiently detailed – even though different organisations may have arranged their data in different ways.
  - **How such data has been used in practice** to give results in each specific sector.
  - **Priorities.** Many development challenges take a long time to solve due to limited resources and capacities. Based on what data is available, we suggest datasets to prioritise releasing the widest possible impacts.

Relevant data does not exist in accessible, digital forms in many contexts within global development. In others, it does not exist at all. However, it is becoming more common for development projects to incorporate data collection and management components to fill this gap for the project's own needs or for official data to be combined with crowdsourced data. The key types of data identified here could also be useful in designing and prioritising these processes.

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## Our methodology in brief

The primary objective of this research is to support people in addressing specific civic and development challenges through the release and application of open data. Our guidance and use cases therefore highlight key sectors, their specific challenges and the data that could be released to help solve them.

The remainder of this report is based on the following main components:

1. **A list of development sectors** and their corresponding civic and development challenges
2. **A list of open datasets** with potential relevance to these challenges
3. **Specific challenges** mapped to requisite open datasets
4. **An extensive database of use cases** illustrating and providing evidence for these mappings

Figure 1 provides a summary of the **seven stages of the research process**, which are described in more detail in the appendix.

**Figure 1. Summary of the research process**



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## How we chose six development sectors and 18 subgoals to support with open data

The starting point for choosing the sectors and subgoals for which open data could have the greatest impacts was to review seven existing development and policy frameworks. Among them were the World Bank development programmes, the UN Millenium Development Goals and the UN 2014 Open Working Group proposal for Sustainable Development Goals (see the appendix for the full list.)

We mapped the frameworks and formed clusters of sectors, goals and themes within them, which were then aggregated, deduplicated and iterated. This process identified 11 development sectors, each with three subgoals.

Our research found a large number of relevant open data use cases. However, because they were not evenly distributed, we narrowed the sectoral focus to those within which open data was more commonly used. By excluding sectors here, we did not undermine the importance of the open data used within them. If more use cases appear in the excluded sectors in future, the methodology of this research can be applied to those sectors as well.

The results were cross-validated against the priorities identified by the World Bank and the UN as well as our own expert-driven sector mapping (see appendix for more information).

**This selection process ultimately identified six sectors, which are: education, health, transport, environment, sanitation and waste, and governance.**

## Tool: Mapping datasets to global development goals

Based on the results of our research, we developed a decision-making tool to help map the six development sectors to a number of high-impact open datasets. It is designed to help policy-makers establish which datasets to prioritise releasing at a national level, depending on the development challenges they seek to address. It can be used to identify datasets which are likely to have an impact across multiple sectors.

The tool is based on an evidence-driven research approach, validated through the expert-driven mapping. Over 100 use cases have been identified and referenced to demonstrate the potential impact of key dataset release.

Figure 2 below shows a visual extract of the tool, implemented in a tabular form online. The resource is available as a [Google spreadsheet](#), [on the web](#) and as a [download](#).

Figure 2. Screenshot of the online tool (showing the tooltip of the first cell)

Data	Health		Education	
	Quality of healthcare provision	Preventing the spread of disease	Access to education	Information & decision-making in education
Education provider performance data				X
Education provider location data			X	X
Education provider census				X
Education provider sanitation data				X
National library bibliography			X	
Library location data			X	
Healthcare provider location data	X			
Healthcare delivery statistics	X			
Clinical and medical practice guidelines	X	X		
Disease, vaccination and prescription statistics		X		
Planimetric Maps		X	X	

**The tool is straightforward to use:** development areas and their subgoals are listed in columns and research-driven datasets are listed in rows. Hovering over the datasets provides a description of the types of data that may be included. The use of an open dataset to address a development subgoal is represented by 'X' – hovering over each 'X' will bring up information about this use, listing key use cases.

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## **Findings: what data is useful for development goals?**

This section highlights datasets that are relevant to six global development sectors, drawn from the dataset mapping tool. They can be used individually or collectively by policy-makers and development groups to explore the value of using and releasing datasets in specific areas.

The global development sectors examined in this report are:

1. Education
2. Health
3. Transport
4. Environment
5. Sanitation and waste
6. Governance

For each sector, the datasets are mapped against three identified subgoals. Each intersection is given an identifying number and defined below, with an explanation of the data it may include. We highlight use cases from developing (and some developed) countries, and describe how the data might impact on a particular development subgoal.

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## 1. Education: promoting access, information and inclusivity

Data	Access to education	Information and decision-making in education	Inclusivity of education
Education provider performance data		1.1	
Education provider location data	1.2	1.3	
Education provider census		1.4	
Education provider sanitation data		1.5	
National library bibliography	1.6		1.7
Library location data	1.8		
Planimetric maps	1.9		
Budget, spending and contracting data		1.10	

### Which kinds of data are useful?

#### Education provider performance data

Data on the performance of each school, such as aggregate examination results obtained at all relevant levels of education including, where possible, types of exams, qualifications and courses offered.

#### Education provider location data

Geocoded locations of schools and other education providers which may include national grid references, addresses and/or latitude/longitude coordinates.

#### Education provider census

Data on various types of education providers and aggregate pupil characteristics for each of them, which may include provider classification, number of pupils, capacity, language and religious character (if any).

#### Education provider sanitation data

Data on the state of the sanitation facilities for each education provider and school, such as clean water accessibility and type and number of toilet facilities.

#### National library bibliography

A catalogue of items available in a nation's libraries, including metadata on both physical and online holdings.

#### Library location data

Geocoded locations of a nation's libraries which may include national grid references, addresses and/or latitude/longitude coordinates and additional information on opening

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times, accessibility and programmes of events where possible.

### **Planimetric maps**

Georeferenced planimetric maps featuring transport, water and building infrastructure provided, where possible, at a suitable resolution (such as 1:25,000).

### **Budget, spending and contracting data**

Data on public sector finances for education, which may include public sector spending by school and by type of expenditure (teachers, books, maintenance, etc), and education department budget, grant and contract data.

## **How can the data be used?**

### **Access to education**

#### **1.2**

Citizens can find and locate schools using tools such as 'Our Schools, Our Data' (Burkina Faso),<sup>26</sup> Check-My-School (Philippines),<sup>27</sup> Pickaskool (Singapore),<sup>28</sup> Find My School (Kenya),<sup>29</sup> eduPOA (Brazil)<sup>30</sup> and Mtawjh (Morocco).<sup>31</sup>

#### **1.6**

Citizens can access libraries' catalogues of items using tools such as Libraries@SG (Singapore).<sup>32</sup>

#### **1.8**

Citizens can find and locate libraries using tools such as Libraries@SG (Singapore).

#### **1.9**

Citizens can identify schools which are most accessible for them or plan the most efficient route to a specific school by using tools such as Find My School (Kenya) and Pickaskool (Singapore), which have been adapted to enable route planning.

## **Information and decision-making in education**

### **1.1**

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<sup>26</sup> Open Data Institute (2014) *Burkina Faso launches open data initiative with mentoring from the ODI and funding from the World Bank*, available at <http://theodi.org/news/burkina-faso-launches-open-data-initiative-with-mentoring-from-the-odi-and-funding-from-the-world-bank>, accessed 2015-03-09

<sup>27</sup> Checkmyschool, <http://www.checkmyschool.org>, accessed 2015-03-09

<sup>28</sup> BasicMove Consultancy (2013) *Pickaskool (Ver 1.0)*, retrieved from <https://itunes.apple.com/sg/app/pickaskool/id629971312>, accessed 2015-03-09

<sup>29</sup> Find my school, <http://findmyschool.co.ke>, accessed 2015-03-09

<sup>30</sup> Petro Dutra (2014) *eduPOA (Ver 1.0)*, retrieved from <https://itunes.apple.com/us/app/edupoa/id929910545?mt=8>, accessed 2015-03-09

<sup>31</sup> Open Data Institute (2014) *Morocco's first open data hackathon*, available at <http://theodi.org/blog/moroccos-first-open-data-hackathon>, accessed 2015-03-09

<sup>32</sup> Ken Toa (2015) *Libraries@SG (Ver 1.0.6)*, retrieved from <https://play.google.com/store/apps/details?id=com.kentoh.libriessg>, accessed 2015-03-09

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Citizens can identify and compare the academic results obtained at different schools and/or geographical areas using tools such as Find My School (Kenya), CourseBoard (Morocco),<sup>33</sup> Mineduc Móvil (Chile),<sup>34</sup> EduSG (Singapore)<sup>35</sup> and Skills Route (UK).<sup>36</sup>

### 1.3

Citizens can identify and compare the distances to different schools using tools such as 'Our Schools, Our Data' (Burkina Faso), Find My School (Kenya), Pickaskool (Singapore), iTutor (Singapore), eduPOA (Brazil) and Mtawjh (Morocco).

### 1.4

Citizens can identify and compare the non-academic characteristics and facilities of different schools using tools such AlfaMD (Moldova),<sup>37</sup> EduSG (Singapore), illustreets (UK)<sup>38</sup> and Mtawjh (Morocco).

### 1.5

Citizens can identify and compare the level of sanitation and the facilities offered by different schools and/or geographical areas using tools such as State of School Sanitation Infographic (Nepal, India),<sup>39</sup> 'Our Schools, Our Data' (Burkina Faso) and NTV Kenya (Kenya).<sup>40</sup>

### 1.10

Citizens can track, monitor and view reports on education budget implementation, enabling them to hold their government to account and demand improved service using tools such as the Education Budget Tracker (Nigeria),<sup>41</sup> Check-My-School (Philippines)<sup>42</sup> and Big Results Now (Tanzania).<sup>43</sup>

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<sup>33</sup> Open Data Institute (2014) *Morocco's first open data hackathon*, available at <http://theodi.org/blog/moroccos-first-open-data-hackathon>, accessed 2015-03-09

<sup>34</sup> Ministerio de Educación (2012) *Mineduc Móvil (Ver 1.6)*, retrieved from <https://play.google.com/store/apps/details?id=cl.tide.mineduc&hl=es>, accessed 2015-03-09

<sup>35</sup> ITDaddy (2013) *EduSG (Ver 1.1.0.0)*, retrieved from <http://www.windowsphone.com/en-us/store/app/edusg/803f3b5c-0348-459b-9c76-cacd0f6fd502>, accessed 2015-03-09

<sup>36</sup> Nesta (2014) *Skills Route shows the way for next generation of education open data apps*, <http://www.nesta.org.uk/blog/skills-route-shows-way-next-generation-education-open-data-apps>, accessed 2015-03-09

<sup>37</sup> Alfa.md, <http://afla.md/>, accessed 2015-03-09

<sup>38</sup> Illustreets, <http://illustreets.co.uk>, accessed 2015-03-09

<sup>39</sup> Open Nepal (2013) *An infographic for state of school sanitation in Nepal* <http://data.opennepal.net/content/infographics-state-school-sanitation-nepal>, accessed 2015-03-09.

<sup>40</sup> International Center for Journalists (2012) *Data "boot camp" helps Kenyan reporter expose school sanitation woes*, available at <http://www.icfj.org/news/data-%E2%80%9Cboot-camp%E2%80%9D-helps-kenyan-reporter-expose-school-sanitation-woes>, accessed 2015-03-09

<sup>41</sup> Global Partnership for Education (2014). *Nigeria: Tracking the education budget with technology*, available at <http://www.globalpartnership.org/blog/nigeria-tracking-education-budget-technology>, accessed 2015-03-09

<sup>42</sup> World Bank (2013) *Philippines: Check-My-School: Monitoring made easy with dedicated volunteers and ICT tools*, available at <http://www.worldbank.org/en/news/feature/2013/02/06/check-my-school-monitoring-made-easy-with-dedicated-volunteers-and-ict-tools>, accessed on 2015-01-05

<sup>43</sup> World Bank (2014) *How Tanzania plans to achieve "big results now" in education*, available at

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## **Inclusivity of education**

### **1.7**

Access to libraries' resources can be extended beyond those in traditional education using tools such as Libraries@SG (Singapore).

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<http://www.worldbank.org/en/news/feature/2014/07/10/how-tanzania-plans-to-achieve-big-reforms-now-in-education>, accessed 2015-03-09

## 2. Health: promoting access, quality and disease prevention

Data	Access to healthcare	Quality of healthcare provision	Preventing the spread of disease
Healthcare provider location	2.1	2.2	
Healthcare delivery statistics	2.3	2.4	
Clinical and medical practice guidelines	2.5	2.6	2.7
Disease, vaccination and prescription statistics			2.8
Planimetric maps	2.9		2.10
Weather data	2.11		2.12
Pollution data	2.13		
Budget, spending and contracting data		2.14	

### Which kinds of data are useful?

#### Healthcare provider location

Geocoded locations of registered healthcare providers (doctors' practices, clinics, hospitals, pharmacies, dental surgeries) which may include national grid references, addresses and/or latitude/longitude coordinates and additional details on the services provided, specialisms and practitioners where possible.

#### Healthcare delivery statistics

Measures of the quality of specific healthcare services based on relevant performance measures and opinion surveys.

#### Clinical and medical practice guidelines

Up-to-date medical information on health issues and treatments.

#### Disease, vaccination and prescription statistics

Statistical information on the prevalence, risk and treatment of diseases and illnesses, where possible, by locality.

#### Planimetric maps

Georeferenced planimetric maps featuring transport, water and building infrastructure provided, where possible, at a suitable resolution (such as 1:25,000).

#### Weather data

Real-time and historic observational data, and forecast data, which may include weather states, temperatures, rainfall and wind speed.

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## Pollution data

Data on various types of pollution including, but not limited to, a pollution inventory (regulated and otherwise), pollutant concentration and area locational data and emissions of air, land and water pollutants.

## Budget, spending and contracting data

Data on public sector finances for health, which may include public sector spending by locality and health care provider, and health department budget, grant and contract data.

## How can the data be used?

### Extending access to healthcare

#### 2.1

Citizens can locate and use the nearest healthcare providers using tools such as Farmacias de Turno Chile (Chile),<sup>44</sup> MOH iHealth SG (Singapore),<sup>45</sup> Health Facilities (Ghana)<sup>46</sup> and Onde ser Atendido (Rio de Janeiro, Brazil).<sup>47</sup>

#### 2.3

Citizens are able to make choices between healthcare providers based on quality, which may encourage the use of healthcare facilities, by using tools such as Temporada De Passes (Uruguay)<sup>48</sup> and Find the Best Hospital (UK).<sup>49</sup>

#### 2.5

Citizens are better able to understand illnesses and treatments, allowing them to make informed decisions about seeking appropriate medication and care, when using tools such as MedAfrica (Africa),<sup>50</sup> InfoVacunas (Chile)<sup>51</sup> and Iodine (USA).<sup>52</sup>

#### 2.9

Medical practitioners are able to locate patients faster using the outputs of mapping projects such as Humanitarian Openstreetmap Team<sup>53</sup> and MSF Missing Map Project.<sup>54</sup>

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<sup>44</sup> Apps Path (2014) *Farmacias de Turno Chile (Ver 1.6)*, retrieved from <https://play.google.com/store/apps/details?id=com.appspath.farmaciasdeturnocil>, accessed 2015-03-09

<sup>45</sup> Ministry of Health, Singapore (2014) *MOH iHealth Sg (Ver 3.0.2)*, retrieved from <https://play.google.com/store/apps/details?id=gov.moh.sg.ihealth.search&hl=en>, accessed 2015-03-09

<sup>46</sup> Health Facilities in Ghana, <https://www.google.com/fusiontables/DataSource?docid=1xxX5BkwVc8uSfRbY04WGMcQbZDPTSj8McMLsz7A#map:id=3>, accessed 2015-03-09

<sup>47</sup> Onde ser Atendido, <http://www.rio.rj.gov.br/web/sms/onde-ser-atendido>, accessed 2015-03-09

<sup>48</sup> 180 Ciencia y data, *Temporada De Passes*, <http://mutualistas.datauy.org/departamento>, accessed 2015-03-09

<sup>49</sup> Find the Best, *Hospital comparison*, <http://hospitals.findthebest.co.uk>, accessed 2015-03-09

<sup>50</sup> MedAfrica, <http://www.medafrika.org/index.php>, accessed 2015-03-09

<sup>51</sup> Jorge Diaz Villegas (2014) *InfoVacunas (Ver 1.2)*, retrieved from <https://play.google.com/store/apps/details?id=cl.ceisufro.infovacunas>, accessed 2015-03-09

<sup>52</sup> Iodine, <http://www.iodine.com>, accessed 2015-03-09

<sup>53</sup> OpenStreetMap, *Humanitarian OpenStreetMap team*, <http://hot.openstreetmap.org>, accessed 2015-03-09

<sup>54</sup> Mediciens sans Frontieres, *Missing Maps project*, <http://www.msf.org.uk/missing-maps-project>,

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## 2.11

Citizens and policy-makers can be made aware of forecasted and current extreme weather events, which may increase their ability to identify, plan and implement measures to mitigate the effects of these on health.

## 2.13

Policy-makers may identify and plan health care interventions and prevention measures using tools which relate levels and sources of pollution to incidences of disease and illness.

## Improving the quality of healthcare provision

### 2.2

Citizens are able to locate the most relevant healthcare provider and service, encouraging the efficient and effective use of healthcare resources, using tools such as Farmacias de Turno Chile (Chile), MOH iHealth SG (Singapore), Health Facilities (Ghana) and Onde ser Atendido (Rio de Janeiro, Brazil).

### 2.4

Citizens are able to identify and challenge providers to increase the quality of healthcare provision using tools such as Temporada De Passes (Uruguay).

### 2.6

Medical practitioners are able to provide efficient and effective care using easy-to-access medical and clinical reference information via tools such as Health eVillages (Worldwide)<sup>55</sup> and AMREF mHealth (Africa).<sup>56</sup>

### 2.14

Citizens and policy-makers are able to compare the level of investment and outcomes of regional healthcare systems, informing the future distribution of funds or the need for greater efficiency, using tools such as healthcare spending visualisations in Kenya.<sup>57</sup>

## Preventing the spread of disease

### 2.7

Citizens are able to better understand the spread of disease, the best preventative measures, symptoms and when to seek care using tools such as MedAfrica (Africa) and InfoVacunas (Chile).

### 2.8

Responses to disease and illness from governmental, third sector and intergovernmental

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accessed 2015-03-09

<sup>55</sup> Health eVillages, <http://www.healthevillages.org>, accessed 2015-03-09

<sup>56</sup> Amref, *The Mobile (R)evolution*, <http://amref.org/news/news/the-mobile-revolution>, accessed 2015-03-09

<sup>57</sup> Kenya Open Data, *Health*, <https://www.opendata.go.ke/page/health>, accessed 2015-03-09

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actors can be coordinated and targeted using platforms such as Healthmap (Worldwide)<sup>58</sup> and Humanitarian Data Exchange (HDX) (Worldwide).<sup>59</sup>

## 2.10

Intergovernmental and non-governmental actors are able to respond more rapidly to outbreaks using the outputs of mapping projects such as Humanitarian Openstreetmap Team (Worldwide) and the MSF Missing Map Project (Worldwide).

## 2.12

Researchers are able to develop computer models to better understand disease patterns, which can inform governments and third parties of where and how disease will spread to improve resource allocation and preventative measures in projects such as QWeCI (Africa).<sup>60</sup>

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<sup>58</sup> HealthMap, <http://healthmap.org/en>, accessed 2015-03-09

<sup>59</sup> Humanitarian Data Exchange, <https://data.hdx.rwlab.org>, accessed 2015-03-09

<sup>60</sup> University of Liverpool, QWeCI, <http://www.liv.ac.uk/qweci>, accessed 2015-03-09

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### 3. Transport: promoting access, efficiency and safety

Data	Access to transport	Efficiency of transport	Safety of transport
Planimetric maps	3.1	3.2	
Public transport timetables	3.3		
Public transport stops/routes location data	3.4		
Traffic flow information		3.5	
Traffic incident location data			3.6
Budget, spending and contracting data		3.7	

#### Which kinds of data are useful?

##### Planimetric maps

Georeferenced planimetric maps featuring transport, water and building infrastructure provided, where possible, at a suitable resolution (such as 1:25,000).

##### Public transport timetables

Timetables for various forms of public transportation (trains, buses, trams, ferries, etc) including, where possible, real-time data or additional information such as prices.

##### Public transport stops/routes location data

Geocoded location for routes, stops and terminals for the various forms of public transport which may include national grid references, addresses and/or latitude/longitude coordinates and additional information on the facilities available where possible.

##### Traffic flow information

Flow rates of traffic at specific locations, including, where possible, real-time information on traffic flow, for example via traffic camera video.

##### Traffic incident location data

Anonymised geocoded locations of traffic incidents which may include national grid references, addresses and/or latitude/longitude coordinates and additional details on severity and type where possible.

##### Budget, spending and contracting data

Data on public sector finances for transport, which may include public sector spending by locality and by project, and transport department budget, grant and contract data.

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## How can the data be used?

### Access to transport

#### 3.1

Awareness and usage of transport infrastructure, such as public foot and cycle paths, may be increased with the use of tools such as Cyclestreets (UK),<sup>61</sup> which can also inform policy and planning around this infrastructure.

#### 3.3

The use of public transport is simplified and promoted by static and live timetable tools, such as Omnibus Interior (Uruguay)<sup>62</sup> and PróximaBarca (Rio de Janeiro, Brazil)<sup>63</sup> and RailYatri (India),<sup>64</sup> which can save citizens time and effort.

#### 3.4

Public transport users, including citizens with mobility barriers, are able to plan efficient routes of public transportation using tools such as KIRI (Jakarta, Indonesia),<sup>65</sup> SoloBus (Montevideo, Uruguay)<sup>66</sup> and Transport Urban (Romania).<sup>67</sup>

### Efficiency of transport

#### 3.2

Motorists are able to plan more efficient routes, which may decrease congestion, by using tools such as Galactio SG GPS (Singapore).<sup>68</sup>

#### 3.5

The efficiency of road transport can be improved by making motorists aware of congestion and improving accident response using traffic-responsive route planning tools such as Galactio SG GPS (Singapore) and traffic camera broadcasts such as Trânsito na Ponte (Rio de Janeiro, Brazil)<sup>69</sup> and SG Traffic Cam (Singapore).<sup>70</sup>

#### 3.7

Citizens and policy-makers are able to ensure the efficient and effective utilisation of

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<sup>61</sup> CycleStreets.net, <http://www.cyclestreets.net>, accessed 2015-03-09

<sup>62</sup> Pilundain (2015) *Omnibus Interior (Ver 1.8)*, retrieved from <https://play.google.com/store/apps/details?id=pilu.horariosbus>, accessed 2015-03-09

<sup>63</sup> PróximaBarca, <http://proximabarca.com.br>, accessed 2015-03-09

<sup>64</sup> RailYatri, <http://www.railyatri.in>, accessed 2015-03-09

<sup>65</sup> KIRI, <http://kiri.travel>, accessed 2015-03-09

<sup>66</sup> SoloBus (2014) *SoloBus Montevideo (Ver 1.1.0)*, retrieved from <https://play.google.com/store/apps/details?id=com.pisco.solobus>, accessed 2015-03-09

<sup>67</sup> Transport Urban, <http://www.transporturban.ro>, accessed 2015-03-09

<sup>68</sup> Quantum Inventions (2015) *Galactio SG GPS Navigation Map (Ver m8-1.3.0)*, retrieved from <https://play.google.com/store/apps/details?id=com.galactio.mobile.sg&hl=en>, accessed 2015-03-09

<sup>69</sup> Trânsito na Ponte, *Câmeras da ponte Rio-Niterói*, <http://transitonaponte.com/cameras/>, accessed 2015-03-09

<sup>70</sup> Megapixel Solutions::Jerry Lim (2014) *SG Traffic Cam (Ver 0.86)*, retrieved from <https://play.google.com/store/apps/details?id=com.megapixel.jerry.trafficc&hl=en>, accessed 2015-03-09

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government resources by increasing the accountability of transport infrastructure projects through budget, contract and spending transparency tools.

## **Safety of transport**

### **3.6**

Safe road usage can be promoted through increased awareness of traffic accidents using tools such as Montevideo traffic accident map (Montevideo, Uruguay)<sup>71</sup> and Bangalore accident map (Bangalore, India),<sup>72</sup> which can also inform transport policy design.

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<sup>71</sup> Cobalys, *Mapa de los puntos con mayor cantidad de accidentes de Transito*, <http://cobalys.com/reporteaccidentes>, accessed 2015-03-09

<sup>72</sup> Rohith B R, (2014) Experts map accident spots across Bangalore, *Times of India*, retrieved from <http://timesofindia.indiatimes.com/city/bengaluru/Experts-map-accident-spots-across-Bangalore/articleshow/34614055.cms>, accessed 2015-03-09

## 4. Environment: addressing climate change, pollution and sustainability

Data	Preservation of the environment	Resilience to climate change and natural disasters	Sustainability and pollution
Planimetric maps		4.1	
Topographic maps	4.2		4.3
Hydrographic data	4.4	4.5	
Forest and deforestation data	4.6		
Weather data		4.7	
Pollution data			4.8
Soil data	4.9		4.10
Mining and mineral production data	4.11		
Waste disposal site location data			4.12
Cadastral map	4.13		

### Which kinds of data are useful?

#### Planimetric maps

Georeferenced planimetric maps featuring transport, water and building infrastructure provided, where possible, at a suitable resolution (such as 1:25,000).

#### Topographic maps

Topographic maps featuring basic natural infrastructure features, such as rivers and forests provided, where possible, in a standard format such as shapefiles or geoJSON.

#### Hydrographic data

Data on the state of rivers and oceans, such as real-time river and sea levels and flow data, flood zone locational data, real-time flood warnings, historical flood data and water quality data.

#### Forest and deforestation data

Data on the state of forests and deforestation of a nation's trees, which may include tree type data, numbers of trees, real-time satellite detection data, legal and known illegal wood processing sites and quantitative site production data.

#### Weather data

Real-time and historic observational, and forecast data, which may include weather states, temperatures, rainfall and wind speed.

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## **Pollution data**

Data on various types of pollution including, but not limited to, a pollution inventory (regulated and otherwise), pollutant concentration and area locational data and emissions of air, land and water pollutants.

## **Soil data**

Data on the state of soil, such as contaminated land locational data, expected soil conditions and nutrients, outlined suitability for different use, ground movement data, pipe corrosion and chemical leach.

## **Mining and mineral production data**

Data on mining and mineral production processes, including legal ID, permission or application status, the stage or state of the production and other data such as name of the exploration company, year started and mineral substance explored.

## **Waste disposal site location data**

Geocoded locations on waste disposal sites which may include national grid references, addresses and/or latitude/longitude coordinates and also data such as accessibility and types of waste disposed where possible.

## **Cadastral map**

A map that shows the precise location (using GPS coordinates), dimensions, boundaries and ownership of land parcels, which may also include additional details such as unique identifying numbers, certificate of title numbers, positions of existing structures and land use.

## **How can the data be used?**

### **Preservation of the environment**

#### **4.2**

Citizens are able to study, understand and plan to preserve biodiversity and habitat using tools such as PlanteAqui (Brazil)<sup>73</sup> and Birdwatching Singapore (Singapore).<sup>74</sup>

#### **4.4**

Citizens can be empowered to promote the preservation of a nation's sea and rivers by having access to information on the levels and causes of its pollution.

#### **4.6**

Citizens can be provided with information on the state of their nation's natural habitats and resources, such as forests, such as how they are being degraded and how to combat any degradation using tools such as InfoAmazonia (Brazil)<sup>75</sup> and PlanteAqui (Brazil).

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<sup>73</sup> Plante Aqui, <http://www.planteaqui.org>, accessed 2015-03-09

<sup>74</sup> Wild Bird Singapore, *Birdwatching hotspots in Singapore*, <http://wildbirdsingapore.nss.org.sg/Default.aspx>, accessed 2015-03-09

<sup>75</sup> InfoAmazonia, <http://infoamazonia.org>, accessed 2015-03-09

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#### 4.9

Citizens are able to understand which soil sites are likely to be most effective for the (re)planting of trees using tools such as PlanteAqui (Brazil).

#### 4.11

Citizens and policy-makers can access detailed information on mining activity using tools such as InfoAmazonia (Brazil) to allow them to track and promote sustainable practices.

#### 4.13

Citizens and policy-makers can identify land use and land use permissions to ensure that protected land is not being used illegally or to the excessive detriment of the environment using tools such as Oil in Yasuní,<sup>76</sup> which are based on cadastral maps.

#### 4.1

Coordinating and tasking volunteers in response to natural disasters can be based upon transport infrastructure during projects such as the Humanitarian Openstreetmap Team (Worldwide).

#### 4.5

Citizens can be made aware of the risk of flooding and be provided with emergency alerts when flooding is imminent using tools such as Shoothill GaugeMap (UK).<sup>77</sup>

#### 4.7

Experts can forecast the risk of natural disaster caused by the weather system and provide critical alerts to citizens when there is a high risk of disaster using tools and projects such as the University of California Santa Barbara's Climate Hazards Group (US/East Africa),<sup>78</sup> the Trans-African Hydro-Meteorological Observatory (US/Sub-Saharan Africa),<sup>79</sup> Shoothill GaugeMap (UK) and Resurgence (UK).<sup>80</sup>

### Sustainability and pollution

#### 4.3

Citizens and policy-makers can be informed on climate change, sustainability and pollution issues through detailed information and evidence provided by tools such as MapStory (US).<sup>81</sup>

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<sup>76</sup> InfoAmazonia, *Oil in Yasuní*, [http://infoamazonia.org/maps/galileu\\_05/#!/story=post-7275&loc=-1.8673451129219134,-77.003173828125.7](http://infoamazonia.org/maps/galileu_05/#!/story=post-7275&loc=-1.8673451129219134,-77.003173828125.7), accessed 2015-03-09

<sup>77</sup> Shoothill, *GaugeMap*, <http://www.gaugemap.co.uk>, accessed 2015-03-09

<sup>78</sup> University of California Santa Barbara, *Climate Hazards Group*, <http://chg.geog.ucsb.edu>, accessed 2015-03-09

<sup>79</sup> Trans-African Hydro-Meteorological Observatory, <http://tahmo.org>, accessed 2015-03-09

<sup>80</sup> Resurgence, <http://www.resurgence.io>, accessed 2015-03-09

<sup>81</sup> MapStory, <http://mapstory.org>, accessed 2015-03-09

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#### 4.8

Citizens are able to identify the level of air pollution in their area using tools such as Web GIS (Moldova),<sup>82</sup> Pollution (UK)<sup>83</sup> and Spare the Air (US).<sup>84</sup>

#### 4.10

Citizens are able to view and report the levels of pollution in soil at specific sites, allowing them to use the land accordingly using tools such as Soil Site Reporter (UK).<sup>85</sup>

#### 4.12

Citizens and policy-makers may be able to identify root causes of pollution from waste disposal and inform the selection of appropriate sites for the disposal of waste.

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<sup>82</sup> Portalul Guvernamental al Datelor Deschise, *Identificarea reziduurilor si cartografierea zonelor poluate*, <http://data.gov.md/ro/aplicatii/identificarea-reziduurilor-si-cartografierea-zonelor-poluete>, accessed 2015-03-09

<sup>83</sup> aMobileFuture (2009) *Pollution (Ver 1.5)*, retrieved from <https://itunes.apple.com/WebObjects/MZStore.woa/wa/viewSoftware?id=304218687&mt=8>, accessed 2015-03-09

<sup>84</sup> Spare the Air, <http://www.sparetheair.org>, accessed 2015-03-09

<sup>85</sup> National Soil Resources Institute, *Soils Site Reporter*, <https://www.landis.org.uk/sitereporter>, accessed 2015-03-09

## 5. Sanitation and waste: improving access, management and recycling

Data	Access to sanitation	Waste management	Recycling
Planimetric maps		5.1	
Pollution data	5.2	5.3	
Waste disposal site location data		5.4	
Toilet facility location data	5.5		
Recycling point location data			5.6
Budget, spending and contracting data 5.7			

### Which kinds of data are useful?

#### Planimetric maps

Georeferenced planimetric maps featuring transport, water and building infrastructure provided, where possible, at a suitable resolution (such as 1:25,000).

#### Pollution data

Data on various types of pollution including, but not limited to, a pollution inventory (regulated and otherwise), pollutant concentration and area locational data and emissions of air, land and water pollutants.

#### Waste disposal site location data

Geocoded locations on waste disposal sites which may include national grid references, addresses and/or latitude/longitude coordinates and data such as accessibility and types of waste disposed where possible.

#### Toilet facility location data

Geocoded locations of toilet facilities which may include national grid references, addresses and/or latitude/longitude coordinates and data on the type of toilet facilities available where possible.

#### Recycling point location data

Geocoded locations of recycling points which may include national grid references, addresses and/or latitude/longitude coordinates and the type of recycling available where possible.

#### Budget, spending and contracting data

Data on public sector finances for sanitation and waste, which may include public sector spending by locality, and departmental budget, grant and contract data.

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## How can the data be used?

### Access to sanitation

#### 5.2

Citizens can be informed of unhygienic or harmful water sources, and therefore avoid using them, using pollution data.

#### 5.5

Citizens can identify and locate a suitable toilet near to them using tools such as Toilet Square (Philippines)<sup>86</sup> and Cablet (Philippines).<sup>87</sup>

#### 5.7

Citizens and policy-makers are able to assess the performance of sanitation improvement schemes and hold them to account using tools such as the Great Indian Toilet Tracker (India)<sup>88</sup> and Sanitation Investment Tracker (Worldwide).<sup>89</sup>

### Waste management

#### 5.1

Policy-makers can better design and position waste management facilities with respect to nearby buildings and water sources, and citizens can be better informed of these plans using planimetric maps.

#### 5.3

Citizens and policy-makers can identify, monitor and benchmark the effects of waste management practices on the wider environment using pollution data.

#### 5.4

Citizens can identify and locate waste disposal sites, allowing them to safely and cleanly dispose of different forms of waste using tools such as LimPOA (Brazil),<sup>90</sup> Descartar Net (Brazil)<sup>91</sup> and mGreen Handbook (Singapore).<sup>92</sup>

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<sup>86</sup> Burhan Rasool (2013) *Toilet Square (Ver Alpha)*, retrieved from

<https://play.google.com/store/apps/details?id=com.toilet.square>, accessed 2015-03-09

<sup>87</sup> Sanitation Hackathon, *Cablet*, <http://www.sanitationhackathon.org/cablet>, accessed 2015-03-09

<sup>88</sup> data.gov.in, *The Great Indian Toilet Tracker*,

<http://data.gov.in/community-application/great-indian-toilet-tracker>, accessed 2015-03-09

<sup>89</sup> Tremolet (2013) *An introduction to the Sanitation Investment Tracker (SIT) mobile app*,

<http://tremolet.com/publications/introduction-sanitation-investment-tracker-sit-mobile-app>, accessed 2015-03-09

<sup>90</sup> Philip Alvarenga (2014) *LimPOA (Ver 1.0)*, retrieved from

<https://itunes.apple.com/br/app/limpoa/id895973608?ls=1&mt=8>, accessed 2015-03-09

<sup>91</sup> Descartar.net, <http://matehackers.github.io/descartar>, accessed 2015-03-09

<sup>92</sup> MDTC (2011) *mGreenHandBook (Ver 1.2)*, retrieved from

<https://play.google.com/store/apps/details?id=com.activity.mGreenHandBook>, accessed 2015-03-09

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## Recycling

### 5.6

Citizens can locate the nearest recycling sites based on the waste they intend to dispose using tools such as Recycle RJ (Rio de Janeiro, Brazil),<sup>93</sup> EcoFinder@SG (Singapore)<sup>94</sup> and Where Can I Recycle? (Montevideo, Uruguay).<sup>95</sup>

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<sup>93</sup> Recycle RJ, <http://windcom.com.br/reciclerj/about.php>, accessed 2015-03-09

<sup>94</sup> Tan Jia Hao (2012) *ecoFinder@SG (Ver 1.2.0.0)*, retrieved from <http://www.windowsphone.com/en-sg/store/app/ecofinder-sg/4691e020-8673-42e7-9719-e7e6bdd6e44b>, accessed 2015-03-09

<sup>95</sup> Open Data Research Network (2014) *Open cities: The case of Montevideo*, available at <http://www.opendataresearch.org/sites/default/files/publications/Opening%20Montevideo-a%20case%20studyfinal.pdf>, accessed 2015-03-09

## 6. Governance: promoting transparency, justice and the economy

Data	Transparency, accountability and citizen engagement	Crime and justice	Economy and finance
Planimetric maps	6.1		
Crime location data		6.2	
Budget, spending and contracting data	6.3		6.4
Electoral data	6.5		
Polling station location data	6.6		
Company register			6.7
Legislation	6.8	6.9	
Cadastral map		6.10	6.11
Market price data			6.12
Information on taxes and tariffs			6.13

### Which kinds of data are useful?

#### Planimetric maps

Georeferenced planimetric maps featuring transport, water and building infrastructure provided, where possible, at a suitable resolution (such as 1:25,000).

#### Crime location data

Anonymised geocoded locations of crimes which may include national grid references, addresses and/or latitude/longitude coordinates and additional data such as the type of crime and an outcome (e.g. an arrest) where possible.

#### Budget, spending and contracting data

Data on public sector finances, which may include public sector spending for each sector, by locality and by public body (at an individual payment level), and budget, grant and contract data by department.

#### Electoral data

Electoral data on political party directories, candidates, constituencies and previous local and general/national election results by constituency and by candidate.

#### Polling station location data

Geocoded locations of polling stations which may include national grid references, addresses and/or latitude/longitude coordinates.

#### Company register

Data on all registered companies, which may include company or business number,

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trading status, legal type, incorporation date, jurisdictions and named directors.

### **Legislation**

Text of national laws, statutes and constitutions published in full, including, where possible, in a machine-readable format.

### **Cadastral map**

A map that shows the precise location (using GPS coordinates), dimensions, boundaries and ownership of land parcels, which may also include additional details such as unique identifying numbers, certificate of title numbers, positions of existing structures and land use.

### **Market price data**

Data on the market price of commodities and commonly-traded goods, which may include daily wholesale maximum price, minimum price and modal price data, locality by locality.

### **Information on taxes and tariffs**

Detailed, up-to-date information on tax and tariff rates levied on individuals and companies, including, where possible, historic tax and tariff rates.

## **How can the data be used?**

### **Transparency, accountability and citizen engagement**

#### **6.1**

Citizens are able to identify the administrative and political boundaries in which they live using planimetric maps and boundary data, with tools such as TheyWorkForYou (UK)<sup>96</sup> and Land Layer (UK)<sup>97</sup>.

#### **6.3**

Citizens are able to see how and where public money is spent, improving economic transparency, using tools such as BudgIT (Nigeria),<sup>98</sup> Budget At Your Fingertips (Brazil),<sup>99</sup> Budget Badger (Philippines),<sup>100</sup> Budget Stories (Moldova)<sup>101</sup> and Caring For My Neighbourhood (Sao Paulo, Brazil).<sup>102</sup>

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<sup>96</sup>TheyWorkForYou, <http://www.theyworkforyou.com>, accessed on 2015-03-09

<sup>97</sup> Land Layer, <http://www.landlayer.com>, accessed on 2015-03-09.

<sup>98</sup> Indigo Trust (2013) *BudgIT Nigeria – Making budget data understandable*, <http://indigostrust.org.uk/2013/03/08/budgit-nigeria-making-budget-data-understandable>, accessed on 2015-01-14

<sup>99</sup> Orçamento ao seu Alcance, <http://orcamento.inesc.org.br/2013>, accessed 2015-03-09

<sup>100</sup> Open Data Research Network (2014). *Budget badger app holds promise for budget monitoring*, available at <http://www.opendataresearch.org/content/2014/580/budget-badger-app-holds-promise-budget-monitoring>, accessed 2015-03-09

<sup>101</sup> Budget Stories, <http://www.budgetstories.md>, accessed 2015-03-09

<sup>102</sup> Cuidando do meu Bairro, <http://cuidando.org.br>, accessed 2015-03-09

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## 6.5

Citizens can learn about local candidates, identify political parties and find out about the democratic process, boosting transparency and engagement in the political process, using tools such as Citizen's Election Portal (Nepal, India),<sup>103</sup> GotToVote (Kenya)<sup>104</sup> and GotToVote (Malawi).<sup>105</sup>

## 6.6

Citizens are able to identify and locate voter registration centres and polling stations to empower them to take part in elections using tools such as GotToVote (Kenya) and GotToVote (Malawi).

## 6.8

Citizens are able to understand and protect their basic rights, increasing engagement and accountability, using tools such as the Nigerian Constitution App (Nigeria).<sup>106</sup>

## Crime and justice

### 6.2

Citizens can identify the locations, numbers and types of crimes that have been committed in their areas, using tools such as CrimeBot (Jamaica),<sup>107</sup> and SpotCrime (USA).<sup>108</sup>

### 6.9

Citizens are able to easily access public legal information, increasing their knowledge of legislation and promoting the rule of law, using tools such as Kenya Law (Kenya),<sup>109</sup> Congreso de La Republica de Columbia (Columbia)<sup>110</sup> and DJPP (Indonesia).<sup>111</sup>

### 6.10

Landowners are able to resolve land disputes and legal proceedings more easily using open cadastral data and property ownership details.

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<sup>103</sup> OpenNepal, *Citizen's Election Portal*, <http://data.opennepal.net/content/citizens-election-portal>, accessed 2015-03-09

<sup>104</sup> GotToVote, <http://gottovote.co.ke>, accessed 2015-03-09

<sup>105</sup> Malawi Election Information Centre, *GotToVote!* <http://gottovote.malawivote2014.org>, accessed 2015-03-09

<sup>106</sup> Pledge51 (2012) *Nigerian Constitution (Ver 2.1.2.1)*, retrieved from <https://play.google.com/store/apps/details?id=com.pledge51.nigerianconstitution&hl=en>, accessed 2015-03-09.

<sup>107</sup> World Bank (2014) *Open data on the ground: Jamaica's crimebot*, <http://blogs.worldbank.org/opendata/open-data-ground-jamaica-s-crimebot>, accessed 2015-03-09

<sup>108</sup> SpotCrime, <http://spotcrime.com>, accessed 2015-03-09

<sup>109</sup> Kenya Law, <http://kenyalaw.org/kl>, accessed 2015-03-09

<sup>110</sup> Senado de la Republica de Colombia, <http://www.senado.gov.co>, accessed 2015-03-09

<sup>111</sup> DJPP, <http://ditjenpp.kemenkumham.go.id/database-peraturan.html>, accessed 2015-03-09

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## Economy and finance

### 6.4

Policy-makers can help make government procurement processes more efficient by analysing budget and public spending data made accessible by tools and services such as Spend Network (UK),<sup>112</sup> Supervizor (Slovenia)<sup>113</sup> and Open Spending (Worldwide).<sup>114</sup>

### 6.7

Citizens are able to easily access important information on registered companies, fostering economic transparency and trust, using tools such as OpenCorporates (UK)<sup>115</sup> and DueDil (UK).<sup>116</sup>

### 6.11

Investors and potential landowners can be more certain of land and property ownership by using cadastral data, which may increase investment and efficiency in business.

### 6.12

Citizens and farmers can find prices of key goods and commodities, encouraging more transparent and efficient markets, using tools such as Tradenet (Sri Lanka),<sup>117</sup> M-Farm (Kenya),<sup>118</sup> Kisan (India)<sup>119</sup> and Market Watch (India).<sup>120</sup>

### 6.13

Citizens, company owners and investors are able to easily anticipate, calculate and pay their tax bills when they can access detailed information on taxes and tariffs, boosting business transparency and investment.

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<sup>112</sup> Spend Network, <https://spendnetwork.com>, accessed on 2015-01-05

<sup>113</sup> Supervizor, <http://supervizor.kpk-rs.si>, accessed on 2015-01-05

<sup>114</sup> Open Spending, <https://openspending.org>, accessed on 2015-01-05

<sup>115</sup> Open Corporates, <https://opencorporates.com>, accessed on 2015-01-05

<sup>116</sup> DueDil, <https://www.duedil.com>, accessed on 2015-01-05

<sup>117</sup> International Research and Training Centre for Rural Education (INRULED), *Tradenet case study*, <http://www.inruled.org/iERD/Cases/Tradenet.pdf>, accessed on 2015-01-05

<sup>118</sup> M-Farm, <http://www.mfarm.co.ke>, accessed on 2015-01-05

<sup>119</sup> metalwihen (2015) *Gramseva: Kisan (Mandi Prices) (Ver B-2)*, retrieved from <https://play.google.com/store/apps/details?id=com.metalwihen.gramseva.kisan&hl=en>, accessed on 2015-01-05

<sup>120</sup> Market Watch (2013) *Market watch - price in India (Ver 1.2.4)*, retrieved from <https://play.google.com/store/apps/details?id=com.mocioun.marketprice&hl=en>, accessed on 2015-01-05

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## Conclusion

Over 100 real-world examples that link six different development sectors to existing open datasets underpin this report. Policy- and decision-makers can learn from these, use them to improve their open data initiatives and support the release of open data to address specific development goals.

Many use cases can benefit from the release of two overarching types of data: **spatial data**, particularly planimetric and topographic maps, and **data on public sector finances** such as budget, spending and contracting. With use of these types of data so widespread, we propose that the release of more spatial data and budget, spending and contracting data should be prioritised to help drive global development.

Despite the numerous examples of use cases in these areas, they remain indicative and are not a quantitative evaluation of the impact of open data in addressing common development goals. Future empirical studies may seek to measure the impact of open data in developing countries in specific domains, potentially with a policy evaluation methodology.<sup>121</sup>

There is plenty of anecdotal evidence supporting the beneficial impacts of open data on transparency, business innovation and economic growth. There is a powerful theoretical economic case for making data published on the internet free, since the marginal cost of distribution is effectively zero.<sup>122</sup> At the same time, open data must be seen as a means to an end. For example, policy- and decision-makers may focus on one of the subgoals from the six development sectors we focus on in order to prioritise what open data to release.

Open data is a recent phenomenon, even in developed countries.<sup>123</sup> However, in conducting this analysis we have found that **open data is already having positive impacts across development sectors and internationally.**

For those looking to develop sustainable open data culture within their organisations, the ODI's white paper '*Open data in government: how to bring about change*' offers guidance on how organisational change within government happens to support and sustain open data in the long-term.<sup>124</sup>

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<sup>121</sup> For some existing studies please refer to the evolving work led by the World Wide Web foundation: Exploring the emerging impacts of open data in developing countries, <http://www.opendataresearch.org/emergingimpacts>, accessed on 2015-01-17

<sup>122</sup> For example, see: Pollock, R. (2009) *The economics of public sector information*. University of Cambridge, Faculty of Economics.

<sup>123</sup> Heimstädt, M., Saunderson, F., & Heath, T. (2014) From Toddler to Teen: Growth of an Open Data Ecosystem. *eJournal of eDemocracy and Open Government*, 6(2), 123-135

<sup>124</sup> Open Data Institute (2015) *Open data in government: how to bring about change*, available at <http://theodi.org/open-data-in-government-how-to-bring-about-change>, accessed on 2015-03-03.

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## **About the Open Data Institute, the Partnership for Open Data and DaPaaS**

This paper is part of a series produced by the Open Data Institute, as part of the Partnership for Open Data (POD), funded by the World Bank. It has also been part-funded by DaPaaS, a data-and-platform-as-a-service approach to open data publication and consumption, funded by the European Union's Seventh Framework Programme for research, technological development and demonstration, under grant agreement no. 610988.

### **What is the Open Data Institute?**

The Open Data Institute (ODI) is an independent, non-profit and non-partisan company based in London, UK. The ODI convenes world-class experts from industry, government and academia to collaborate, incubate, nurture and explore new ideas to promote innovation with open data. It was founded by Sir Tim Berners-Lee and Professor Sir Nigel Shadbolt, and offers training, membership, research and strategic advice for organisations looking to explore the possibilities of open data.

In its first two years, the ODI has helped to unlock over US\$55m in value through the application of open data. With 26 nodes around the world, the ODI has trained more than 1,000 people from over 25 countries. In 2014, the ODI trained officials from countries including Botswana, Burkina Faso, Chile, Malaysia, Mexico, Moldova, Kyrgyzstan and the UK on the publication and use of open data.

### **What is the Partnership for Open Data?**

The Open Data Institute has joined Open Knowledge and the World Bank in the Partnership for Open Data (POD), a programme designed to help policy-makers and citizens in developing countries to understand and exploit the benefits of open data. The partnership aims to: support developing countries to plan, execute and run open data initiatives; increase reuse of open data in developing countries; and grow the base of evidence on the impact of open data for development. The initial funding comes from The World Bank's Development Grant Facility (WB DGF).<sup>125</sup>

Under POD, the ODI has carried out open data readiness assessments, strategic advice, training and technical assistance for low- and middle-income countries across four continents. One example is our work in Burkina Faso, supporting the launch of their open data initiative and providing technical assistance to construct an open data portal.

In 2015, POD will merge with the Open Data for Development (OD4D) network. As part of this new, larger network, the ODI will continue to take a lead in supporting the world's government leaders in implementing open data, and in doing so will continue to publish practical guides and learning materials, such as this series of reports.

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<sup>125</sup> Find more on the Partnership for Open Data at <http://theodi.org/odp4d>

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## What is the DaPaaS project?

DaPaaS (Data-and-Platform-as-a-Service) is a research project funded by the European Union's Seventh Framework Programme for research, technological development and demonstration, under grant agreement no. 610988. It will deliver a platform with associated tools and services for making publishing, hosting and consuming linked open data easier. DaPaaS will give publishers the tools they need to create high quality linked data and will give developers commercial grade tools, clean and efficient APIs and better documentation, so that they can reliably work with large datasets.<sup>126</sup>

Please cite this paper as 'Open Data Institute (2015) Prioritising open data to drive global development. ODI white paper ODI-WP-2015-003. London, UK. Available at <http://theodi.org/guides/prioritise-open-data-to-drive-global-development>.

## Appendix I: Methodology

The primary objective of this research is to support people to release and apply open data to help solve specific civic and development challenges. Figure 1 summarises the seven stages of the research process, described in more detail below.

### Figure 1. Summary of the research process

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<sup>126</sup> Find more on DaPaaS at <http://project.dapaas.eu>

1	Establish a set of key development sectors by clustering and rearranging goals and subgoals within existing development frameworks
2	Collect strategic dataset recommendations and aggregate them to develop a meaningful and relevant list for developing countries
3	Consult experts to conceptually map development sectors against strategic datasets, based on existing knowledge
4	Gather an evidence base of over 100 open data use cases within these development sectors
5	Select a number of areas where there is substantial evidence of open data usage within a development context
6	Use the evidence base to identify development subgoals and practical datasets
7	Combine the two approaches and the final list of datasets into an overall mapping tool with specific recommendations for each development sector

### Stage 1: Establishing sectors from existing development frameworks

Firstly, existing development and policy frameworks were scoped in order to gain a holistic understanding of current development challenges and surrounding literature. This resulted in the identification of seven distinct frameworks:

- World Bank sectors<sup>127</sup> and project themes<sup>128</sup>
- World Bank Global Monitoring Report 2014/2015: Ending Poverty and Sharing Prosperity<sup>129</sup>
- UN Millenium Development Goals<sup>130</sup>
- UN 2014 Open Working Group proposal for Sustainable Development Goals<sup>131</sup>

<sup>127</sup> World Bank, *Projects and operations by sector*, <http://www.worldbank.org/projects/sector>, accessed on 2015-01-05

<sup>128</sup> World Bank, *Projects and operations by theme*, <http://www.worldbank.org/projects/theme>, accessed on 2015-01-05

<sup>129</sup> World Bank (2014) *Global monitoring report 2014/2015: Ending poverty and sharing prosperity*, available at <http://www.worldbank.org/en/publication/global-monitoring-report>, accessed on 2015-01-05

<sup>130</sup> United Nations, *Millenium Development Goals*, <http://www.un.org/millenniumgoals>, accessed on 2015-01-05

<sup>131</sup> United Nations (2014) *Open Working Group proposal for Sustainable Development Goals*, available at <http://sustainabledevelopment.un.org/index.php?page=view&type=400&nr=1579&menu=35>, accessed on 2015-01-05

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- UN High-Level Panel on the Post-2015 Development Agenda report<sup>132</sup>
  - MYworld UN consultation on post 2015 Sustainable Development Goals<sup>133</sup> (part of the World We Want)<sup>134</sup>
  - LSE Cities 'Going Green' Report<sup>135</sup>

The frameworks proved to be diverse in both granularity and scope. Their differences were reconciled in order to develop a common set of approximately equal development sectors. To do this, the frameworks were mapped visually against one another before the following actions were carried out:

1. Common sectors, goals, words and themes from all sources were drawn together to form clusters
2. From each cluster, the high-level sector was identified (e.g. transport)
3. Within each cluster, subgoals that were repeated (exactly, by synonym or in essence) were amalgamated and specific subgoals were subsumed into more general ones
4. From this process, three lower level subgoals for each sector were identified (e.g. efficiency of transport)
5. The list of sectors was cross-checked with the interests and spending patterns of the World Bank (see above) to ensure significant sectors have been considered
6. A standardised wording was developed for consistency and comparability
7. The process was iterated and cross-checked between multiple researchers

This process identified 11 development sectors, each with three subgoals. The full list of these sectors and subgoals is documented in Appendix I.

## Stage 2: Reducing, regrouping and aggregating strategic datasets

Existing lists of strategic government datasets were collected to identify key, or core, datasets that exist across nations and their governments. A number of lists were identified, as compiled by open data experts, for a variety of purposes. Those deemed significant were:

- G8 Open Data Charter Technical Annex<sup>136</sup>
- Global Open Data Index<sup>137</sup>

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<sup>132</sup> UN High-Level Panel on the Post-2015 Development agenda (2014) *A new global partnership: eradicate poverty and transform economies through sustainable development*, available at <http://www.beyond2015.org/sites/default/files/HLPReport.pdf>, accessed on 2015-01-05

<sup>133</sup> MYWorld2015, *Data*, <http://data.myworld2015.org/>, accessed on 2015-01-05

<sup>134</sup> World We Want 2015, <http://www.worldwewant2015.org>, accessed on 2015-01-05

<sup>135</sup> LSE Cities (2013) *Going green: how cities are leading the next economy*. LSE Cities, London School of Economics and Political Science, London, UK, available at <http://files.lsecities.net/files/2013/06/Going-Green-Final-Edition-web-version.pdf>, accessed 2014-12-22

<sup>136</sup> Cabinet Office (2013) *G8 Open Data Charter and Technical Annex*, available at <https://www.gov.uk/government/publications/open-data-charter/g8-open-data-charter-and-technical-annex#technical-annex>, accessed 2014-12-22

<sup>137</sup> Open Knowledge, *Global Open Data Index*, <http://index.okfn.org/>, accessed on 2015-01-05

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- Open Data Barometer<sup>138</sup>
  - ODI National Information Infrastructure datasets<sup>139</sup>
  - Good Basic Data for Everyone<sup>140</sup>

An extensive list of datasets was compiled using these sources. However, this list contained dataset repetition, country-specific idiosyncrasies and varying levels of granularity. To address these issues:

1. The number of datasets was reduced by removing clear repetitions/duplication
2. Datasets which referred to country specific features were repurposed
3. Datasets which described different facets of analogous phenomena were aggregated

This process generated a list of key datasets which are suitably universal and granular. This refined list was extensive, containing 105 datasets, and can be found in Appendix II.

### **Stage 3: Mapping data to sectors with expert guidance**

We performed a conceptual mapping of the 11 identified high-level development sectors against the list of 105 datasets. In this expert-driven approach, open data researchers completed the mapping based on their knowledge and experience.

The conceptual mapping assumed practical feasibility; researchers were encouraged to make the assumption that the datasets identified were published accurately and in full. Likewise, the assumption was made that there would be a suitably resourced developer community to use the data. The mapping was also carried out at a relatively high level of scope, that is, to sectors and not subgoals. This allowed for more general inferences to be made.

In total, five open data researchers completed the matrix. Except for Researcher 4, the number of interactions between datasets and developments sectors, or “Xs” in the matrix, was roughly constant at around 250 (see Table 1). In 80% of cases, three or more researchers agreed on their mapping.<sup>141</sup> We used the output of this mapping to validate the completeness of the range of applications, case studies and reports (compare further stage 7).

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<sup>138</sup> Open Data Research Network (2013) *Open Data Barometer 2013 Global Report*, available at <http://www.opendataresearch.org/barometer>, accessed on 2015-01-05

<sup>139</sup> <https://github.com/theodi/shared/wiki/National-Information-Infrastructure-Datasets>, accessed on 2015-01-05

<sup>140</sup> Danish Government (2012) *The eGovernment Strategy 2011-2015: Good basic data for everyone - a driver for growth and efficiency*, available at [http://uk.fm.dk/publications/2012/good-basic-data-for-everyone/~/\\_media/Publikationer/Imported/2012/Gode%20grunddata%20til%20alle/BasicData\\_UK\\_web\\_2012.10.08.ashx](http://uk.fm.dk/publications/2012/good-basic-data-for-everyone/~/_media/Publikationer/Imported/2012/Gode%20grunddata%20til%20alle/BasicData_UK_web_2012.10.08.ashx), accessed on 2015-01-05

<sup>141</sup> More sophisticated statistics on inter-rater reliability are available on request

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**Table 1. Expert-driven mapping: number of interactions between datasets (105) and developments sectors (11)**

Researcher 1	255
Researcher 2	232
Researcher 3	262
Researcher 4	153
Researcher 5	250

#### **Stage 4: Gathering an evidence base of applications, case studies and reports**

We then undertook a process of extensive evidence gathering; first by dividing the 11 development sectors by the individual expertise of members of the research team. Each researcher completed extensive research to gather examples (“use cases”) of the use of open data in each of their sectors.

The key resources used to develop this evidence base were:

- ODI Pinboard, a collection of online resources by the Open Data Institute<sup>142</sup>
- World Bank open data use cases<sup>143</sup>
- Open Data Research Network projects and literature<sup>144</sup>
- Application/tools showcase sections of data portals, such as data.rio<sup>145</sup>
- Data journalism resources, such as the Guardian datablog<sup>146</sup>
- Wider desk research

Many use cases were also identified through discussion with experts and sector specialists.

The methodology behind gathering the evidence base centered around case selection. For example, Gerring (2007)<sup>147</sup> and Flyvbjerg (2006)<sup>148</sup> explore in detail the possible strategies for selecting putative cases. For this research we adopted a paradigmatic selection: “to develop a metaphor or establish a school for the domain that the case concerns”. In particular, the cases selected cover most sectors of our interest, contain the

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<sup>142</sup> ODI Pinboard, <https://pinboard.in/u:theodi>, accessed on 2015-01-06

<sup>143</sup> World Bank Group Finances, *Open data use cases & solutions - survey responses*, <https://finances.worldbank.org/Reference/Open-Data-Use-Cases-Solutions-Survey-Responses/hibh-z4ax>, accessed on 2015-01-06

<sup>144</sup> Open Data Research Network, <http://www.opendataresearch.org/>, accessed on 2015-01-05

<sup>145</sup> Data.rio, *Aplicativos* <http://data.rio.rj.gov.br/aplicativos>, accessed on 2015-01-05

<sup>146</sup> Guardian datablog, <http://www.theguardian.com/data>, accessed on 2015-01-05

<sup>147</sup> Gerring, J. (2007) *Case study research: principles and practices*. New York, NY: Cambridge University Press

<sup>148</sup> Flyvbjerg, B. (2006) Five Misunderstandings about case study research. *Qualitative Inquiry*, 12(2), 219–245. doi:10.1177/1077800405284363

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greatest amount of relevant information and are therefore best suited in showcasing trends in the use of open data to address development challenges.

The inclusion of the use cases (tools, applications and case studies) documented in this report was based on three criteria. Each of the cases must be:

1. **Dependent**; the success of the case should depend on the use of government data
2. **Relevant**; the relationship between the case and at least one development sector should be evident
3. **Replicable**; the case should be applicable to a wide range of developing countries

Evidence of how each use case met these criteria was generally considered to be explicit and/or implicit in the supporting documentation. Where evidence of the criteria was not available, the researchers were able to make judgements based on their own experience and knowledge of open data use cases.

In addition to the specified criteria for individual use cases, two considerations were made of the overall evidence base. First, the cases should be geographically diverse to demonstrate a broad applicability of open data to development sectors. Second, they should provide new and interesting uses.

Including use cases from developed nations was sometimes justified. They either provided supplementary value or offered outstanding examples that the researchers identified as replicable and scalable within many developing country contexts.

### **Stage 5: Selecting sectors underpinned by evidence**

Our research yielded a large number of relevant use cases. Despite this, these cases were not evenly distributed across the 11 identified sectors. In order to complete a well-evidenced dataset mapping process (described below), we concentrated on selected sectors.

A number of criteria were reviewed and considered to narrow the sectoral focus, with the number of suitable use cases available being the primary driver of the selection process; those sectors with too few suitable use cases for mapping were therefore excluded from further research. In addition, we referred to the expert-driven mapping of datasets to development sectors and the sectors of the expert-identified strategic datasets. This ensured those sectors deemed significant by expert opinion were included in the evidence-based mapping process.

What are the implications of excluding a sector? In general, an exclusion does not diminish the importance of the sector. Open data may still have a major impact. However, there are insufficient established use cases to consider them further in this research. If future use cases appear in the excluded sectors, the methodology of this research can be applied to those sectors as well.

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A development sector of ‘economic prosperity’ is included in Appendix I. While economic prosperity is a vital development goal – sometimes the primary development goal – it was difficult to treat it as a separate ‘sector’ in our analysis because improvement in other sectors contribute to economic prosperity. We did however identify a number of cross-cutting components of economic prosperity which were not covered in our work on other sectors. Of these, transparency and efficiency were therefore subsumed into an economy and finance subgoal within the sector of governance. We also considered the cross-cutting components of employment, inequality or innovation; but we could not identify sufficient use cases at this stage to take them forward into the subsequent stages of our work.

In addition, the results of this selection process were cross-validated against the priorities identified in World Bank spending<sup>149</sup> and the MyWorld UN post-2015 consultation.<sup>150</sup> This ensured that the sector coverage aligned suitably with the wider priorities of eminent development organisations.

As a result of this process, we identified six sectors for evidence-driven mapping. These were:

1. Education
2. Health
3. Transport
4. Environment
5. Sanitation and waste
6. Governance

## **Stage 6: Evidence-driven mapping**

Each example of open data use that we found linked the six key development sectors and their subgoals to existing open datasets, following a process of:

1. Identifying *which* use cases from the evidence base related to each sector
2. Identifying *how* each use case related to each sector, i.e. which subgoal(s) the case affects
3. Identifying the exact datasets, and the types of data they include, used in each use case
4. Completing an iterative approach of approximating/reconciling these exact datasets to the expert-identified dataset list and expanding the dataset descriptions (the difference between the two lists was the level of dataset granularity; this evidence-driven mapping focuses on specific use cases across developing countries, whereas those expert-identified datasets cover broader

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<sup>149</sup> World Bank (2014) *Annual report 2014*, <http://www.worldbank.org/en/about/annual-report>, accessed on 2014-11-20, p. 59

<sup>150</sup> MYWorld2015, *Data*, <http://data.myworld2015.org/>, accessed on 2014-11-20

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geographic and sectoral range)

5. Cross-validating this new dataset list with the available datasets of countries such as USA,<sup>151</sup> Kenya<sup>152</sup> and India<sup>153</sup> to ensure that the conceptual datasets were both practical and universal

The result of this process was a list of 35 proposed datasets, each with a detailed description of the types of data they may include, mapped against the six development sectors and their subgoals using real use cases. Over 60 different denotations describe the relationship between the datasets and the development sectors.

## Stage 7: Combining expert guidance with evidence

In the final stage of the methodology, we combined the two approaches outlined in steps 3 and 6: building on expert guidance with data-driven evidence. This process used expert-driven mapping to highlight any putative missing relationships of the research-driven mapping process and to cross-validate plausibility of listed use cases.

In summary, the evidence-driven mapping proved to be a strong resource on its own. In most cases, the use cases preempted the hypothesised relationship between datasets and development sectors. In a few cases, such as pollution data, the expert-driven mapping stimulated additional research.

## Appendix II

### Full list of identified sectors

1. **Transport**
  - a. Access to transport
  - b. Efficiency of transport
  - c. Safety of transport
2. **Health**
  - a. Access to healthcare
  - b. Quality of healthcare
  - c. Preventing the spread of disease
3. **Education**
  - a. Access to education
  - b. Information and decision-making in education
  - c. Inclusivity of education

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<sup>151</sup> Data.gov, <http://www.data.gov>, accessed on 2015-01-06

<sup>152</sup> Kenya Open Data, <https://www.opendata.go.ke/>, accessed on 2015-01-06

<sup>153</sup> Open Government Data (OGD) Platform India, <http://data.gov.in/>, accessed on 2015-01-06

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4. **Environment and natural resources management**
    - a. Preservation of the environment
    - b. Resilience to climate change and natural disasters
    - c. Sustainability and pollution
  
  5. **Sanitation and waste management**
    - a. Access to sanitation
    - b. Waste management
    - c. Recycling
  
  6. **Governance**
    - a. Citizen engagement and responsiveness
    - b. Transparency and accountability
    - c. Crime and violence
  
  7. **Economic prosperity**
    - a. Innovation and entrepreneurship
    - b. Employment and unemployment
    - c. Trade and investment
  
  8. **Food and water**
    - a. Access to affordable and healthy food
    - b. Access to clean water
    - c. Sustainable agriculture
  
  9. **Human settlements**
    - a. Ability to house citizens
    - b. Ability to manage urbanisation
    - c. Access to infrastructure
  
  10. **Social development**
    - a. Social equality
    - b. Gender equality
    - c. Social and financial security
  
  11. **Energy**
    - a. Access to electricity
    - b. Efficiency in the delivery of energy
    - c. Reliability of energy in homes

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## Appendix III

### Datasets used for expert-driven mapping

Dataset name
Company/business register
GP/hospital/dentists/clinical reference data
Information about local processes/administration
Legislation
Maps of transport infrastructure
Rural land register
School Census
Spatial information
Spend reports
Weather forecast and observational data
Broadband coverage
Cadastre
Central government procurement
Contracts (framework and otherwise)
Court listings
Crime statistics
Disaster risk map
Hydrographic data
Information about food businesses such as hygiene ratings
Information about power stations
Locations of stops/routes of public transport systems
Medicines
Mobile phone coverage
Monitoring determinants
National population projections
Parliament
Planning applications
Police station locations
Police workforce
Polling stations
Power network

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Protected areas
Public sector bodies
Public spending statistics
Public transport timetables
Rail timetables
Regulated pollutants
River network
Road traffic and congestion
Social housing
Street level crimes
Taxes such as VAT
Vehicle register
Wards
Waste and recycling centres
Weather observation points
A&E weekly data
Aggregated hospital episode statistics
Average energy efficiency homes
Basic company data
Benefits statistics
Business activities (standard industrial classification)
Business plans for central government departments
Business population estimates
Business: activity, size and location
Car parking information
Cereal stocks
Citizenship statistics
Coastguard stations
Commercial and market intelligence of key suppliers to government
Consumer price indices
Cost of organised crime
Court locations
Critical care bed capacity
Departmental energy consumption
Departmental organograms
Employment and earnings
Fire incidence response times

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Fire stations
Fishing activity data
Govt construction strategy strategic supplier data
Grants register
Higher education statistics
Historical data for meteorological stations
Hospital activity data
House price index
Housing market
Immigration statistics
Import licence applications
Indicators of natural disasters
Insolvency statistics
Job centres
Justice statistics
Locations, inventory of museums
Locations, inventory of public libraries
National coach services
National parks
Police (boundaries)
Police powers and procedures
Political parties
Pollution measuring points
Practice prescribing data
Prison population
Privately-funded providers of higher education (HE)
Public roles and salaries
Public sector finances
Real time energy usage
Real time rail performance
Small and medium sized enterprise statistics (SME)
Special advisers number and costs
Stolen vehicle data
Traffic camera video
Types of court
Waste disposal site records
Water well archive



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