Open Data for Sustainable Development

WORLD BANK GROUP

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Executive Summary

Governments around the world are opening up the data they collect in many areas as a new kind of public resource. They are finding that this *Open Data* can be used to identify social and economic trends, improve public services, build trust in government, and promote economic growth. Governments, businesses, foundations, NGOs, and academic institutions have developed programs to put Open Data to use, and many have focused on its potential to support international development. The World Bank has developed a methodology to help governments around the world assess and build their Open Data programs. This paper discusses what Open Data is and how it relates to broadly defined international development goals, presents diverse use cases in different sectors of development, and proposes a plan of action that governments and their data users can apply to improve Open Data worldwide.

Open Data is data freely available online for anyone to use and republish for any purpose. While social media, companies, and NGOs can all be sources of Open Data, the most widely used sources come from government and government-supported institutions (which this paper will broadly call "open government data"). This open government data can be used to create both social and economic value. Recently, a number of studies have recognized the business value of Open Data, which may run into trillions of dollars annually worldwide.

The power, versatility, and accessibility of Open Data make it a key resource for development.

A large number of examples now demonstrate how Open Data can support development in areas that relate to the post-2015 United Nations Sustainable Development Goals.[1] The key benefits of Open Data in developing countries are to:

1. Foster economic growth and job creation.

Open Data can promote economic growth by helping launch new businesses, optimizing existing companies' operations, creating jobs, and improving the climate for foreign investment. It can also make the job market more efficient and serve as a resource in training for critical technological job skills.

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1   Report of the Open Working Group of the General Assembly on Sustainable Development Goals: http://www.un.org/ga/search/view_doc.asp?symbol=A/68/970&Lang=E

2. Improve efficiency, effectiveness and coverage of public services.

Open Data can help strengthen healthcare systems by connecting patients to providers; promote education and ongoing learning; and relieve hunger and improve food security on both a large and small scale.

3. Increase transparency, accountability, and citizen participation.

Open Data plays a critical role in improving governance by exposing and preventing mismanagement and corruption. It also helps ensure environmental sustainability through transparent data that can help reduce pollution, conserve natural resources, and build resilience to climate change.

4. Facilitate better information-sharing within government.

Open Data can help improve cities and urban infrastructure: It is key to high-tech "smart cities," to modern urban planning and to the transformation of urban transportation. It can also improve resilience to disasters and ensure that critical resources will be deployed well in emergency situations.

These outcomes can only be achieved with usable, accessible data. The United Nations Secretary-General's Independent Expert Advisory Group on a Data Revolution for Sustainable Development has identified several ways in which the global data supply needs to be improved. These include the need to promote innovation to fill data gaps, to overcome inequalities between data-poor and data-rich people, and to provide leadership and coordination to enable the data revolution to support sustainable development.[2] While the U.N. report was written in the context of statistical data, it applies equally to other government data as well.

In order to meet these data-supply challenges, government will need to harness private-sector resources and prioritize their work based on data users' needs. The key is partnership between data providers and data-users – what has been called a "demand-driven" approach to open data. By engaging data users, including those in the private sector, governments can focus on releasing data that will have immediate social and economic benefits.

This paper concludes with a number of key actions, ranging from policy decisions to technical solutions, that can help governments and their data users collaborate to develop robust Open Data programs. These include recommendations to:

- Support Open Data use through legal and licensing frameworks.
- Make data available for free online.
- Publish data inventories for the government's data resources.
- Create feedback channels to government from current and potential data users.
- Prioritize the datasets that users want.

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2   "A World That Counts": UN Secretary-General's Expert Advisory Group on Data Revolution Report: http://www.unglobalpulse.org/IEAG-Data-Revolution-Report-A-World-That-Counts

- Address quality issues in key government datasets.
- Make detailed, disaggregated, inclusive data available.
- Protect privacy rights.
- Provide sufficient data about the data.

Introduction

As governments around the world have recognized the value of Open Data, new organizations and networks have been launched to help make use of this important public resource. Foundations, NGOs, and academic institutions have developed programs of Open Data research. Many have focused on Open Data's potential to support international development. By one count, there are more than 160 such organizations now working to help apply Open Data in developing countries.[3]

The Open Government Partnership initiated in 2011, which includes a focus on Open Data, has gained momentum among both developed and developing countries. Roughly half of the 65 members of the Open Government Partnership, whose members make commitments to opening their government data, are developing countries.[4] In order to be eligible to participate in OGP, governments must demonstrate a minimum level of commitment to open government principles in four key areas (Fiscal Transparency, Access to Information, Income and Asset Disclosures, and Citizen Engagement). While Open Data is not a requirement for OGP membership, it has become a part of many OGP countries' action plans.[5]

The World Bank has developed a methodology to help governments around the world assess and build their Open Data programs. The Bank's Open Data Readiness Assessment, or ODRA, has now been used in two dozen countries to lay the groundwork for these initiatives.[6] The Bank also offers an Open Data for Business tool to engage the private sector with government and other support in implementing new Open Data programs. The Bank's global practices also make it possible to do focused work applying Open Data in agriculture, education, energy, finance, health, and other areas where the Bank has deep expertise.[7]

This paper is a brief introduction to the field of Open Data for development. It discusses what Open Data is and how Open Data relates to broadly defined international development goals, presents diverse use cases in different sectors of development, and cites resources for more in-depth examination of the issues.

Open Data can be used to create both economic and social value by supporting better governance, new ventures, better public services, and better decision-making in and outside of government.

Accessible, usable data about government budgets, contracts, and activities can help increase trust in government and citizen engagement, as well as bolstering a government's international reputation and a country's potential to attract foreign investment. A right to this kind of information has been recognized for years as an important tool for government transparency and accountability. Open Data takes this one step further by ensuring that the information is not only accessible but also searchable and analyzable, enabling more effective scrutiny. The U.S.-based Sunlight Foundation, drawing on work done by the

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3   For example the POD paper, "Open Data in Developing Countries: State of the Art"

4   http://www.opengovpartnership.org/

5   The criteria to join the Open Government Partnership are summarized in http://www.opengovpartnership.org/

6   http://opendatatoolkit.worldbank.org/en/odra.html

7   World Bank Global Practices and Projects:

http://www.worldbank.org/en/about/unit and http://www.worldbank.org/projects/sector?lang=en

Open Knowledge Foundation and others, has published a set of principles for opening up government data with a focus on transparency.[8]

More recently, the business and economic value of Open Data has also become increasingly clear. In the U.S. and the UK, for example, large open datasets in weather, GPS, and real estate have formed the basis for companies worth billions of dollars. Open Data has also fueled a growing number of smaller companies in many countries and across many sectors of the economy.[9]

Several studies have attempted to estimate the economic value of Open Data worldwide. The most widely quoted is a study by the McKinsey Global Institute,[10] which estimated that Open Data used in seven sectors of the economy could create three to five trillion dollars annually in economic value worldwide. That figure includes the value of several kinds of Open Data besides government data. Other studies, analyzed in a separate World Bank paper,[11] have focused more specifically on open government data. The direct, annual economic value of open government data has been estimated in two different studies as up to 40 billion euros throughout the European Union and close to 2 billion pounds in the UK.

The discrepancy between these figures is due to several factors, but illustrates one key point: The economic benefits of Open Data accrue not only to companies that use the data, but to the people they serve. The McKinsey study focused largely on the "downstream" benefits of businesses driven by Open Data, and found that Open Data ultimately benefits consumers even more than businesses. These beneficiaries can include farmers who increase their crop yields by working with data-driven agriculture companies, shoppers who find better prices through data-enabled websites, workers who use Open Data services to improve their education and training, and many others.

A 2014 World Bank study found that business and social benefits of the use of Open Data often overlap. This study of companies using Open Data found that many "operate in sectors with high social impact – health and wellness, environment, agriculture, transport." This work is not limited to commercial enterprises: NGOs in the same fields are finding that Open Data can help them in their missions.[12]

Open Data also helps governments improve public services – one of the most direct benefits of its use. Social service agencies are using data to help prospective patients find medical clinics or emergency care; to improve access to high-quality education; to improve public transportation and encourage its use; and to make emergency services more effective in natural disasters, among other improvements. By opening up their data, government agencies make it possible for others to analyze it in many ways, making their own data more useful to the agencies that have provided it.

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8   http://sunlightfoundation.com/policy/documents/ten-open-data-principles/

9   Open Data 500, a survey of 500 U.S. companies across various sectors using different applications of Open Data: http://www.opendata500.com

10   Manyika et al., "Open Data: Unlocking Innovation and Performance With Liquid Information," McKinsey & Company, 2013.

http://www.mckinsey.com/insights/business_technology/open_data_unlocking_innovation_and_performance_with_liquid_information

11   Stott, "Open Data for Economic Growth," World Bank, 2014. http://www.worldbank.org/content/dam/Worldbank/document/Open-Data-for-Economic-Growth.pdf

12   Morrison et al., "New surveys reveal dynamism, challenges of open data-driven businesses in developing countries," World Bank, 2014.

http://blogs.worldbank.org/opendata/new-surveys-reveal-dynamism-challenges-open-data-driven-businesses-developing-countries

What is Open Data?

While Open Data has been defined and characterized elsewhere in detail[13], a basic description is that it is data that is freely available online for anyone to use and republish for any purpose. True Open Data should be in a machine-readable form, that is, a format that can be readily processed and analyzed by computers. Some definitions and use cases, however, include data that is available on the Web even if it is not fully machine-readable.[14] This report includes examples of this kind of data since many government datasets are not yet machine-readable, even in countries like the U.S. and UK, which have each been pursuing Open Data policies since 2009. As more online data becomes machine-readable over time, it will become even more useful and should fuel more applications like those described here.

Open Data overlaps with two related concepts: Open Government and Big Data.

The goal of Open Government is to promote transparency, public participation, and collaboration between government and the governed. [15] It can include initiatives as diverse as online petition websites, crowdsourcing platforms to let citizens help shape legislation, or data about government spending, contracts, and operations. While the transparency aspect of Open Government involves Open Data, Open Government also requires citizen participation and government accountability.

Open Data is also distinct from Big Data, which describes very large or complex datasets that must be processed using advanced analytic techniques.[16] Some valuable Open Data is also Big Data, such as weather and satellite data, geospatial data, and some kinds of data on health, finance, energy, and the environment. The distinguishing feature of Open Data is not its size or complexity, however, but the fact that it is made available as a public good.

In general, much of the most important Open Data comes from public sources, while Big Data, such as data on customer records, is often proprietary. This public-private division is not absolute. Some recent experiments have shown that private-sector data collection can become a valuable public resource. Orange, a leading telecom provider, is now making call detail records available to researchers studying population mobility patterns, epidemiological trends, measures of wellbeing, and other issues relevant to development. [17] For the most part, however, data collection for public use is still the province of governments and some international NGOs.

This paper is concerned primarily with open government data, which is the most widely used type of Open Data in many though not all countries. Unless otherwise specified, "Open Data" here refers to data that comes from a government agency or is gathered under government auspices. This includes not only statistical data from statistical agencies but also operational, administrative, reference and other data that is gathered about healthcare, transportation, education, agriculture, or other social and economic

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13   Open Definition: http://opendefinition.org/od

14   Referencing the 1 star level in Tim Berners Lee 5 star Deployment Scheme: http://5stardata.info/

15   President Obama on the Open Government Initiative: https://www.whitehouse.gov/open

16   Gurin, "Big data and open data: what's what and why does it matter?" The Guardian, 2014. http://www.theguardian.com/public-leaders-network/2014/apr/15/big-data-open-data-transform-government

17   http://www.d4d.orange.com/en/home

sectors. Other kinds of Open Data, which are often used together with government sources, include data that is provided by international agencies and civil society organizations, collected from public postings on social media, gathered and shared by citizens themselves, or released by corporate entities for public use.

Many countries have now adopted the principle that government data should be "open by default" – that is, that it should be made open and available online unless there are sound and proportionate reasons, such as privacy or security, not to do so for specific data. This principle is endorsed by the Open Government Partnership and now required by some international funders. It will require judgment, policy guidelines, and technical approaches to balance this principle against security concerns and privacy rights.

Open Data's value in addressing development goals

The power, versatility, and accessibility of Open Data make it a key resource for development. A study by the Open Data Institute, "Supporting sustainable development with Open Data"[18], describes three major benefits of Open Data for development: It can "i) more effectively target aid money and improve development programs, ii) track development progress and prevent corruption, and iii) contribute to innovation, job creation and economic growth." More broadly, Open Data can help achieve many of the objectives outlined in the Millennium Development Goals[19] and the draft Sustainable Development Goals.[20] Open Data also embodies the principles of the U.N. Data Revolution for Sustainable Development,[21] which emphasizes data availability, equal access to data, and the use of data for achieving development goals. The two Annexes to this paper show how Open Data specifically supports the Sustainable Development Goals and the goals of the Data Revolution.

A large number of examples now demonstrate how Open Data can support different areas of international development. Open Data can be used to advance most if not all of the 17 draft post-2015 U.N. Sustainable Development Goals. There is good evidence for Open Data's value in supporting many widely recognized objectives for development, including to:

Specifically, Open Data has been demonstrated to:

- Foster economic growth and job creation.
- Improve efficiency and coverage of public services.
- Increase transparency, accountability, and citizen participation.
- Facilitate better information-sharing within government.

The following sections give a number of examples of ways that Open Data is being used to help achieve these goals and areas of opportunity for further work. While they focus on examples from developing

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18   http://theodi.org/supporting-sustainable-development-with-open-data

19   http://www.worldbank.org/mdgs/

20   http://www.un.org/ga/search/view_doc.asp?symbol=A/68/970&Lang=E

21   http://www.undatarevolution.org/wp-content/uploads/2014/11/A-World-That-Counts.pdf

economies, they include some examples from high-income countries that could serve as models for innovation elsewhere.

Fostering economic growth and job creation

Open Data can promote economic growth by helping launch new businesses, helping existing companies optimize their operations, creating jobs, and improving the climate for foreign investment.

Fostering economic growth

Open Data can promote economic growth - a subject that has been fully analyzed in another World Bank paper[22] – by helping launch new businesses, optimizing existing companies' operations, improving the climate for foreign investment, and bringing economic benefit to consumers of products and services.

Overall, Open Data benefits the private sector in two basic ways: It provides the raw material for innovative new data-driven businesses, and it helps existing companies optimize their business by operating more efficiently and reaching customers more effectively. New companies are using Open Data to provide entirely new kinds of products and services. These can be as simple as mobile apps or as ambitious as major companies that have launched using weather, agriculture, geospatial, and housing or real estate data. At the same time, existing companies using data to improve operations in areas like shipping, employee health care, and energy use can increase profits and lead to company growth and more jobs.

Companies that apply Open Data don't only benefit themselves, but also promote economic growth through the other businesses and consumers that they serve. In Kenya, for example, m-Farm has become a successful business using Open Data in the agricultural sector by providing market information, linking farmers to buyers, and tracking agricultural trends.[23] But as important as m-Farm's success is the fact that a farmer using its services may double his income.

For new businesses, Open Data is not just a resource for developing products and services; it can also be a means to getting the financing needed to launch a company in the first place. Innovative new lending companies in several countries are using Open Data to provide financial help to small businesses. The Mexican company Aspiria[24] uses Open Data to facilitate micro-lending. Mexico's Konfio[25] and Columbia's Lenddo[26] use market and other data sources to provide loans to people with no credit history.

Improving the Foreign Investment Climate

Open Data can give potential investors essential information they need on a country's governance, infrastructure, and resources.

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22   Stott, "Open Data for Economic Growth," World Bank, 2014. http://www.worldbank.org/content/dam/Worldbank/document/Open-Data-for-Economic-Growth.pdf

23   http://www.mfarm.co.ke/

24   https://www.aspiria.mx/

25   https://konfio.mx.prestamos/

26   https://www.lenddo/com/

Another major benefit of Open Data is its positive impact on the potential for investment. Investors may be interested, for example, in data about census statistics, workforce skills, tariffs, land, or the national information infrastructure. All these forms of Open Data can reflect the resources and infrastructure available to support investment in new ventures. For foreign investors concerned about risk, transparent Open Data about the workings of government can be especially valuable.

The process used by the Millennium Challenge Corporation, a major vehicle for U.S. Foreign Aid, illustrates the importance of data in investment decisions. The Corporation uses a number of indicators as criteria for considering countries eligible for funding. While these indicators are developed by third parties (including the World Bank), they reflect measures related to the economy, health, education, and the environment. The Corporation uses these indicators to produce country scorecards which, in turn, are used by foreign investors to make their decisions.[27]

Increasingly, investors may look to a country's own open government data – not just third-party data – as a similar guide to investment decisions. The extent of a country's Open Data program itself is now being seen as an indicator of good government, an important measure for investors. Two major initiatives now track the implementation of Open Data programs around the world: the Open Data Barometer[28], published by the World Wide Web Foundation, and the Open Data Index[29] from Open Knowledge, both updated annually. Countries that are looking to attract international investment may find that a higher ranking on the Index, the Barometer, or both is helpful to them.

Reducing poverty and income inequality and promoting job growth

Open Data can help alleviate poverty and increase employment on several levels. It can help people in poverty improve their lives; make the job market more robust and efficient; and serve as a resource in training for critical technological job skills.

At the most basic level, several countries are using Open Data to improve income equality for their poorest citizens. In India, Transparent Chennai provides data and information to help residents in poor areas make claims to the government for the rights and services they are entitled to.[30] By improving citizen's immediate living situation, for example through improved healthcare, this kind of data can improve their ability to seek employment and ultimately move out of poverty over time.

Open Data can also help create new job opportunities by helping to launch and grow businesses, as described above. New businesses create new jobs by definition. As existing businesses use Open Data to become more efficient and profitable, they are likely to grow and increase their hiring as well.

A particular kind of Open Data - information that can be used to match job-seekers with employers - can help increase national employment levels overall. In high-income countries, both private companies like Linked In and Monster.com and government information systems help job seekers. The latter include the

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27   https://www.mcc.gov/pages/selection/indicators

28   Open Data Barometer: http://www.opendataresearch.org/project/2013/odb

29   Open Data Index: http://index.okfn.org/

30   http://www.transparentchennai.com/

Occupational Information Network, or O*NET, in the U.S.,[31] the employment data published by the UK government, Open Data[32] and the Australian Public Service Commission.[33]

Other countries are developing their own job-matching platforms, using a combination of mobile and internet tools. In the Philippines, for example, a startup called Kalibrr uses natural language processing to match job seekers to companies seeking people with their skills.[34] Souktel[35] serves six countries in the Middle East and Africa, and claims to have reduced the average time to search a job from 12 weeks to just one week in the West Bank and Gaza. Other services include Assured Labor[36], which operates in Brazil, Nicaragua, and Mexico, and LabourNet[37] in India.

A 2013 World Bank report on ICT's potential to expand employment opportunities summarized the value for job-matching services to both employers and potential employees. For employers, these services make it possible to find more qualified candidates through a larger candidate pool, reduce recruiting costs and time, find people to hire for entry level and low-skill level jobs, and apply filters so that specific listings will be visible only to qualified applicants. Job seekers can avoid the time and cost of submitting their profiles through a traditional employment agency, search for jobs without having to travel to the employer's location, increase the chance of employment by getting access to more job openings quickly and efficiently, and receive advice, training, and services to make their work experience and skills look more professional and attractive to employers.[38]

Worldwide, improved job-matching can have significant economic benefits: the McKinsey Global Institute has estimated that "online talent platforms" could benefit more than half a billion people a year by 2025. As the Institute points out, this can have a huge impact at a time when 30 to 45 percent of the working-age population worldwide is "unemployed, inactive in the workforce, or working only part-time."[39] It's not yet certain whether this kind of job-matching will become as important in developing economies as in developed ones. However, there is reason to expect Open Data on jobs, when it is made available online or by cellphone, can be particularly important to poor people, those with mobility issues, or women who have been out of the workforce.

Finally, Open Data itself can be a tool for training young people in the technology skills that can lead to successful employment. TuvaLabs, for example, uses a wide variety of datasets this way and has helped promote data skills in the U.S., in India, and elsewhere, including through a partnership with the World

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31   A news article on the O*NET. http://www.washingtonpost.com/business/on-it/how-big-data-could-make-job-hunting-less-stressful/2015/03/13/9b1aab10-c9b6-11e4-b2a1-bed1aaea2816_story.html

32   http://www.lmiforall.org.uk/

33   https://www.omidyar.com/sites/default/files/file_archive/insights/ON%20Report_061114_FNL.pdf

34   https://www.kalibrr.com/

35   http://www.souktel.org/dev-products/job-matching

36   http://assuredlabor.com/

37   http://labournet.in/

38   ICT Sector Unit, The World Bank, Connecting to Work: How information and communication technologies could help expand employment opportunities, Washington, DC, September 2013.

39   Manyika, et al. "Connecting talent with opportunity in the digital age," McKinsey Global Institute, 2015.

http://www.mckinsey.com/insights/employment_and_growth/connecting_talent_with_opportunity_in_the_digital_age

Bank in Sudan.[40] Governments around the world now run challenges and hackathons that use Open Data at a national, regional, or city level, and teachers can put together teams of computer science students to compete. The success of these programs will depend on the demand for technically skilled workers in a given country as well as the supply. In some regions, however, technical training can help create both a more skilled workforce and a wider range of opportunities for them.

In this context, Open Data is a potentially valuable resource for teaching and training the analytic and coding skills that can help develop a new workforce. Since much Open Data is also Big Data, it can be used to help teach analytic skills that can also be applied to large proprietary datasets, which are much in demand in the private sector. There are still many unrealized opportunities to connect government ICT programs with Open Data and with data science training.[41]

Improving efficiency, effectiveness and coverage of public services

Open Data can help strengthen healthcare systems by connecting patients to providers; promote education and ongoing learning; and relieve hunger and improve food security.

Strengthening healthcare systems

Open Data connects patients to healthcare providers, provides a check on healthcare quality, helps keep medical costs in check, and enables fundamental education, treatment, and prevention for infectious disease.

In both lower- and higher-income countries, Open Data has become an effective tool for connecting potential patients to high-quality healthcare. In Mexico, Medii[42] uses geospatial data and government data on pharmacy locations and prices to help consumers find the medicines they need when they need them. Tipsdokter[43] in Indonesia, Medicinia[44] in Brazil, and eVaidya[45] in India use online data-driven systems to improve healthcare access.

For lower-income countries, using data to find efficiencies and improve effectiveness may be even more critical so they can help make the most of limited healthcare resources. The Southern Africa Regional Programme on Access to Medicines and Diagnostics (SARPAM) uses data "to improve efficiency and competition in the market for essential medicines in the Southern African Region and thereby meet the health needs of the poor."[46] Open government data combined and supplemented with crowdsourced data can also be critical in tracking infectious disease, supporting maternal health and nutrition programs,

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40   https://tuvalabs.com/

41   Boyera & Iglesias, "Open Data in Developing Countries: State of the Art," Partnership for Open Data, 2014. https://docs.google.com/document/d/1FMyfLu-jouL7j7Pw0kEwUn_B07aZ9IX3vlFGqPO0gX0/edit

42   http://medii.co/

43   https://www.techinasia.com/free-medical-consultation-straight-home-indonesias-tipsdokter/

44   http://medicinia.com.br/

45   http://www.evaidya.com/

46   http://www.sarpam.net/

finding vulnerable populations, and serving many other requirements of an efficient and effective healthcare system.

But Open Data may make the greatest difference in countries where health problems are urgent and healthcare is hard to come by, as the experience of several African countries has shown. In Uganda, three-quarters of child mortality is caused by preventable disease compounded by poor healthcare. An Open Data program designed with staff from the World Bank has used data from household surveys and healthcare facilities to monitor the effectiveness of healthcare and reduce childhood mortality significantly.[47] Rwanda's TRACnet, developed with the Treatment and Research AIDS Centre (TRAC), the Ministry of Health, and others, has collected and used Open Data to manage the treatment of patients with HIV/AIDS.[48] And medAfrica, in Kenya and other African countries, uses mobile phones to disseminate basic health information and help people find hospitals when they need them.[49]

Promoting education and ongoing learning

Open Data helps ensure the availability of quality education, reduces corruption in education funding, improves school operations, and gives parents information to find the best education for their children.

Many countries are now using open government and other data to show the availability and quality of public schools. In Kenya, the national government and several NGOs are using a mapping platform to show areas where educational resources are lacking. Tanzania has established the website Shule.info to help assess the quality of schools as well.[50]

A number of organizations in Mexico are using Open Data both to assess school quality and to promote innovation. The company ENOVA uses different kinds of data to develop innovative educational models. Its founder describes the use of Open Data as "urban acupuncture" – using data to do pinpoint analysis of schools based on population density, access to transportation and broadband, and other factors.[51] The website Mejora Tu Escuela[52] helps parents learn about local schools, compare them, and choose, much as GreatSchools[53] does in the United States.

In many countries, Open Data about basic school operations and facilities may be the most important information needed to improve the schools and students' education. A newspaper-based campaign in Uganda[54] and the website CheckMySchool in the Philippines[55] use information to reveal and deter corruption that can keep schools from getting the funds they're entitled to. In Romania, an open bid platform has focused on inefficiency rather than corruption by making it easier for vendors to bid on

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47   http://www.povertyactionlab.org/publication/power-people-evidence-randomized-field-experiment- community-based-monitoring-project-uga

48   www.tracnet.rw

49   http://www.medafrica.org

50   http://theodi.org/supporting-sustainable-development-with-open-data

51   http://www.opendatanow.com/2015/02/new-datos-abiertos-latin-americas-data-boom/

52   http://www.mejoratuescuela.org/

53   http://www.greatschools.org/

54   Reinikka & Svensson, "Fighting Corruption to Improve Schooling: Evidence from a Newspaper Campaign in Uganda," Journal of the European Economic Association, 2010. http://siteresources.worldbank.org/EXTGOVANTICORR/Resources/3035863-1291223960989/Uganda_Corruption_Newspaper_Nick.pdf

55   www.checkmyschool.org

contracts for school supplies – and has reduced prices by about one-quarter.[56] Basic sanitation issues such as inadequate toilet facilities can interfere with children's education – a problem that a TV journalist addressed by using Kenya's Open Data Platform.[57]

Relieving hunger and improving food security

Open Data is improving agriculture on both a large and small scale by improving the transparency and efficiency of markets, helping farmers adopt more productive and efficient techniques, and empowering consumers through information.

An international Open Data initiative called GODAN – Global Open Data for Agriculture and Nutrition – has become a centralized resource for farming and food security. GODAN is a partnership bringing together entities focused on Open Data, agriculture, and development, working together in the interest of food security. It builds on increasing evidence that Open Data has the potential to lead to a new green revolution.[58] A number of companies, most notably the Climate Corporation in the U.S., are using sophisticated analysis of weather and satellite data to promote what has been called "precision agriculture."[59]

In addition to agricultural efforts at this scale, several developing countries have seen the growth of new entrepreneurial companies that help small farmers with relevant data. In Ghana, the company Farmerline sends farmers essential information on weather and agriculture by voice and text to their mobile phones.[60] Solapa, an Argentinian company, is building a platform to help farmers analyze their crop strategy and yield by combining market data with sensory and GIS data.[61] In a similar way, Chile has used open U.S. satellite data from Landsat to help estimate water demand under the country's frequent droughts, and help agricultural businesses adjust water use strategically for different crops.[62]

Open Data can also help counter local problems that can interfere with agriculture and the food supply. A government program in Uganda used SMS messaging to inform farmers about a disease affecting the banana crop, reaching 190,000 people in the first five days and helping prevent an epidemic.[63] In Jamaica, a research project of the Caribbean Open Institute is using Open Data to combat praedial larceny – the theft of crops and livestock.[64] And in Mexico, the advocacy group Fundar developed an online database showing that billions of dollars in government farm subsidies were going disproportionately to wealthy farmers, a fact that led to reform in the subsidy program.[65]

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56   http://www.e-licitatie.ro

57   http://www.icfj.org/videos/health-assignment-toilets-and-grades

58   http://www.godan.info/

59   Gurin, Open Data Now, 27-31.

60   http://www.farmerline.org

61   http://www.solapa4.com/en

62   https://www.fort.usgs.gov/sites/landsat-imagery-unique-resource/case-studies/vineyards-and-apple-and-olive-orchards-chile

63   http://theodi.org/supporting-sustainable-development-with-open-data

64   http://blog.usaid.gov/2013/04/who-stole-my-cow-open-data-and-praedial-larceny/

65   http://www.undatarevolution.org/wp-content/uploads/2014/11/A-World-That-Counts.pdf

Increasing transparency, accountability, and citizen participation

Open Data plays a critical role in improving governance by exposing and preventing corruption. It also helps ensure environmental sustainability by reducing pollution, conserving natural resources, and building resilience to climate change.

Strengthening institutions and governance

Open Data plays a critical role in improving governance by exposing and preventing mismanagement and corruption and promoting innovation in public administration.

Beyond reviewing general data about financial and government operations, foreign investors and watchdog organizations have become especially concerned about government corruption. In that context, government contracts have come under particular scrutiny, and the benefits of Open Data about contracting have become apparent. Open contracting – making government contracts available for public review – deters favoritism and hidden deals, and simultaneously benefits government, businesses, and investors. In Russia, a website called Clearspending, which monitors over 12 million contracts with open government data, has helped to identify more than 4 million procurement violations to date.[66] The Open Contracting Partnership is developing standards for contracting data and supports efforts to make contracting more transparent worldwide.[67]

By reducing corruption, open contracting has direct economic benefits for government. A European Commission report estimated the cost of corruption in the EU as around 1 percent of GDP, while other estimates put the global cost of corruption at 5 percent of GDP worldwide.[68] Open Data promotes transparency and accountability and deters corruption by making it easier for journalists and watchdog groups to expose questionable deals. A report by Lateral Economics estimates that making data open can reduce corruption by 10 percent.[69]

Several countries have launched spending transparency initiatives – often for their own internal controls at least as much as for their international reputation. Brazil's Transparency Portal launched in 2004 with the initial goal of simply documenting the transfer of federal money to cities and states. A decade later, the Portal had a much wider portfolio of information, ranging from elected officials' credit card records to the funding of the World Cup, and was tracking more than $12 trillion in government funds.[70] In Slovenia, the application Supervizor was successfully developed by that country's Commission for the Prevention of Corruption. Supervizor, which provides civil society and government authorities with information on

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66   "Unleashing the Potential of Open Data in Russia" The World Bank News, 2015: http://www.worldbank.org/en/news/feature/2015/01/13/unleashing-the-potential-of-open-data

67   Open Contracting Data Standard: http://ocds.open-contracting.org/standard/r/1__0__RC/en/standard/intro/

68   EU Anti-Corruption Report: http://ec.europa.eu/dgs/home-affairs/e-library/documents/policies/organized-crime-and-human-trafficking/corruption/docs/acr_2014_en.pdf

69   Open for Business: How Open Data Can Help Achieve the G20 Growth Target
https://www.omidyar.com/sites/default/files/file_archive/insights/ON%20Report_061114_FNL.pdf

70   Brazil's Transparency Portal Data: http://www.portaltransparencia.gov.br/sobre/Origem.asp

government financial transactions, received 2 million hits the first day and went on to win the UN Public Service Award.[71]

On the positive side, Open Data can help bring innovation from the outside into public administration. Through challenges, hackathons, and other approaches, Open Data allows citizens to interact with government agencies and participate to innovate on public services and public information delivery.

Ensuring environmental sustainability

Open Data helps reduce pollution, conserve natural resources, and build resilience to climate change.

Major national and international data programs are now addressing climate change and other fundamental environmental issues. Some have provided Open Data on mining, drilling, and energy industry practices in the hope that transparency will prevent bad practices out of fear of public reaction. The Extractive Industries Transparency Initiative has set guidelines for the release of Open Data on these industries' practices, and dozens of countries now subscribe to its principles.[72]

At the same time, other Open Data programs are designed to help cities and countries become more resilient in the face of climate change and the floods, droughts, and other extreme events that may ensue. One of the most ambitious is the U.S. Climate Data Initiative, a cross-governmental effort to make data from a wide range of federal agencies available for analysis. The initiative is being implemented through a number of public/private partnerships. The National Oceanic and Atmospheric Administration, which supplies many critical, very large datasets, has now partnered with a number of major technology companies to make the data available through the cloud for public use.[73]

Several countries have developed their own Open Data systems for tracking environmental issues. The World Resources Institute, often in partnership with NGOs working on environmental issues, now runs a Global Forest Watch site that the governments of Indonesia and Singapore use to crack down on illegal burning by pulp and paper companies. Those companies also use the data themselves to put out fires that they're responsible for.[74] In New Zealand, a partnership known as LAWA (Land, Air, Water Aotearoa) has launched a website that provides data on water quality at more than 350 beaches in the country.[75]

Facilitating better information-sharing within government

Open Data is key to high-tech "smart cities," to modern urban planning and improvements in urban infrastructure, and to the transformation of urban transportation, and can also help countries manage disaster risk.

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71   http://supervizor.kpk-rs.si/

72   https://eiti.org/

73   Otto, "Tech titans ready their clouds for NOAA weather data," Fed Scoop, 2015. http://fedscoop.com/commerce-department-partners-with-cloud-providers-to-open-large-amount-of-noaa-data-1

74   http://www.undatarevolution.org/wp-content/uploads/2014/11/A-World-That-Counts.pdf

75   http://lawa.org.nz

Improving cities and urban infrastructure

Open Data is key to high-tech "smart cities," to modern urban planning, and to the transformation of urban transportation.

One of the most ambitious visions for Open Data is the prospect of rethinking urban infrastructure through "smart cities." The concept of smart cities involves combining government-provided Open Data with extensive, diverse, and timely data collected from sensors around the city that measure traffic, air quality, and other factors. Initiatives like the IBM Smarter Cities program have helped develop the concept around the world.[76] Some countries are making it an integral part of planning: India's prime minister has now pledged to build 100 smart cities across the country.[77]

While smart cities remain a somewhat futuristic concept, Open Data is already being used as a tool for understanding urban issues and improving urban planning. In China, where the Open Data movement has grown city by city, Shanghai and Beijing have launched Open Data portals that each have hundreds of datasets on weather, air and water quality, commerce, transportation, and more. In Beijing, the Urban Data Lab[78] at the Tsinghua Urban Planning and Design Institute[79] focuses on Beijing's Xicheng district, the largest part of the old city, and provides demographic, socioeconomic, and mapping data for research analysis. The data is not fully open to the public, but is open to interested parties to use at the lab on-site.[80]

Urban transportation is also being transformed by Open Data. There are now hundreds of apps around the world that help commuters know when the next bus or train is coming, from YourBus in India[81] to NextBus[82] in the U.S The Digital Matatus project in Kenya addressed an even more basic problem: There was no map for Nairobi's matatu minibus system so commuters didn't know where to wait for a ride.[83] Apps are helping with car transportation as well. To help riders avoid rogue taxi-drivers, who have been known to rob their customers, Mexico City is developing an app that will let riders take pictures of license plates by phone and learn immediately if their cab is safe.[84]

Beyond such helpful consumer applications, innovations in several cities are showing how data can fundamentally improve transportation systems. Moscow's transit authority used Open Data to make the city's transportation network more efficient: Data analysis showed that the city's needs could be met by redrawing 100 bus routes rather than building a new rail line, saving $1 billion.

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76   http://www.ibm.com/smarterplanet/us/en/smarter_cities/overview/

77   http://edition.cnn.com/2014/07/18/world/asia/india-modi-smart-cities/

78   http://xc.urbandatalab.com/

79   http://www.thupdi.com/

80   http://www.opendatanow.com/2014/12/peoples-republic-open-data/

81   http://www.yourbus.in/

82   http://www.nextbus.com/

83   www.digitalmatatus.com

84   http://www.opendatanow.com/2015/02/new-datos-abiertos-latin-americas-data-boom/

Managing disaster risk

Open Data improves resilience to disasters and ensures that critical resources will be deployed well in emergency situations.

Some of the most effective applications of Open Data – not only government data, but also data gathered from citizens – have been in managing disaster risk and relief efforts. The organization Ushahidi was launched in Kenya during a period of political violence, and used data gathered by cellphone to track violent events and target law enforcement to them. Over the last several years it has used the same approach in disaster management as well, most notably in coordinating relief efforts during the 2010 earthquake in Haiti.[85]

When Rio's transportation system was devastated by floods, the city set up a centralized system with data on public transport, traffic, and tidal levels. Businesses and individual citizens can now access Rio Datamine to help prepare or recover from any future disasters.[86]

Open Data can also help protect some of the most vulnerable urban areas – like the unplanned, informal settlements like those that house almost three-quarters of the residents of Dar es Salaam. Settlements like these have very poor infrastructure and are especially susceptible to damage from flooding and other disasters. The Ground Truth Initiative organized a project to map the Dar es Salaam settlements, and that map became the basis of a website built on the Ushahidi platform to help residents report flooding and other problems.[87]

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85   http://www.ushahidi.com/

86   http://riodatamine.com.br/#/homepage

87   http://tandale.ramanitanzania.org/ushahidi/

Strategies to leverage Open Data

The potential of Open Data is clear. It is an essential, multifaceted public resource that can be used to help meet a wide range of development goals. It can help both for-profit and non-profit organizations create new solutions to social challenges, create jobs, foster economic growth, and improve the lives of millions of people.

The key to realizing this potential is partnership between data providers and data-users – what has been called a "demand-driven" approach to open data. Opening government data is not a one-sided exercise. To do it effectively requires ongoing engagement between governments, the ICT sector, and data users.

Launching a new national Open Data program presents a circular problem: National governments may be hesitant to release data until they see the economic and social benefits, but companies and other organizations cannot demonstrate those benefits until they have access to Open Data. The problem is especially daunting because many countries have trouble finding the funds and the people needed to develop new Open Data initiatives. By engaging data users, particularly those in the private sector, governments can focus their resources on releasing data that will have immediate social and economic benefits.

Funding and technical capacity are not the only challenges to be overcome. Analyses by the World Bank,[88] the Open Data Institute[89] , and the Open Data in Developing Countries project[90] have identified a number of obstacles to using data in lower-income countries, including these:

- Lack of clear legal and policy guidelines or clear open licensing
- A 'digital divide' between rich and poor, affecting both the supply and use of data
- Organizational culture in government ministries that inhibits data sharing
- A mismatch between the demand for Open Data and the supply of appropriate datasets
- Data released in a form that is too high-level – not granular enough to be fully useful

These issues can best be addressed by joint problem-solving between government ministries providing data and the "customers" for their data. While it's important to solve all these problems, it's not necessary to solve them all at the same time. Public-private collaboration can help government ministries address these problems by beginning with priorities that can make a larger Open Data program more manageable and scalable.

The strategies described below make up a nine-point plan that governments can use to develop effective, sustainable Open Data programs. They're described sequentially, from those that simply require policy

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88   http://blogs.worldbank.org/opendata/open-data-development-impact-crucial-role-private-sector

89   http://theodi.org/supporting-sustainable-development-with-open-data

90   http://www.timdavies.org.uk/2014/07/22/3484/

decisions to those that require more programmatic and technical approaches. Together, they can help make government data open in ways that are relevant, accessible, and actionable for data users.[91]

- **Support Open Data use through legal and licensing frameworks.** To even consider pursuing data-driven innovation, data users need to be sure that they have the legal ability to download, analyze, and publish open government data in whatever way they see fit. Legal frameworks that clearly support the right to republication can promote innovation and experimentation with Open Data.

- **Make data available for free online.** As the value of government data becomes clear, many government ministries may be tempted to charge for its use. However, if users have to pay for data, then the data is not truly open and will not be as widely used. An Australian study of key statistical datasets found the benefit of making one dataset available for free equaled five times what the government could charge for it; in another case, the economic benefit of wider use was more than ten times the potential revenue.[92] For this reason, the European Union's Directive is that government data should be made available for no more than the marginal cost of distribution, which, for data downloaded from the internet, is essentially zero.[93] A Capgemini study cites findings that publishers that reduce their prices dramatically, moving to marginal cost, zero cost, or cost-recovery models, see the use of their data increase by 1000 percent to 10,000 percent.[94]

- **Publish data inventories for the government's data resources.** To make use of Open Data, innovators need to have the legal right to reuse it, need to be able to use it for free – and need to be able to find it in the first place. Companies and organizations can't use datasets that they don't know exist. To maximize the value of a country's Open Data, each ministry and the central government should assess its data resources and release a data inventory showing what kinds of Open Data it has available and where to find it. A single, national, open data portal can be a good way of doing this. Best practices recommend a single portal for all open data to ensure open data is published in a consistent, standardized way harmonized across all government agencies.

- **Create feedback channels to government from current and potential data users**. Policies that encourage data use and publication of data inventories set the stage for a meaningful dialogue between governments and data users. This engagement can take the form of in-person workshops, ongoing advisory councils to government, surveys, feedback through websites,

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91   A separate World Bank policy note includes several recommended policies to maximize Open Data's value specifically for economic growth. See http://www.worldbank.org/content/dam/Worldbank/document/Open-Data-for-Economic-Growth.pdf

92   https://www.omidyar.com/sites/default/files/file_archive/insights/ON%20Report_061114_FNL.pdf

93   Janssen & Hugelier, "Open data as the standard for Europe? A critical analysis of the European Commission's proposal to amend the PSI Directive," European Journal of Law and Technology, 2013. http://ejlt.org/article/view/238/411

94   https://www.capgemini.com/resource-file-access/resource/pdf/the_open_data_economy_unlocking_economic_value_by_opening_government_and_public_data.pdf

outreach programs, or other strategies. The World Bank is developing an engagement process and tool that can be integrated with its Open Data Readiness Assessment.

- **Prioritize the datasets that users want.** By engaging with data users, governments can identify the datasets that have the greatest public value and concentrate on them – a prioritization process that makes it possible to launch a successful Open Data program with limited resources. Open government data may follow an 80/20 rule - roughly 20 percent of the data may hold 80 percent of the public value. By engaging with their data users, government ministries can identify that 20 percent and put a high priority on improving the quality, accessibility, and usability of those datasets, while planning to make the rest of their data more open and usable over time. They may also choose to focus on what has been called "core reference data" or "national information infrastructure" – data that is broadly used for business and government operations, such as maps, address databases, demographic census data, transportation data, and corporate registration data.[95]

- **Address quality issues in key government datasets.** Data does not have to be perfect when a government ministry publishes it, but it should be as usable as possible. As the UN Data Revolution report put it, "too many countries still have poor data, data arrives too late and too many issues are still barely covered by existing data."[96] No country, including those with well-established Open Data programs like the U.S. and the UK, can afford to fix basic problems in all its Open Data at once. But as government ministries learn which datasets are most important to their users, they can and should address basic quality issues. The need to improve data quality has to be balanced against the value of releasing data freely and quickly, even in an imperfect form.

- **Make detailed, disaggregated, inclusive data available.** Detail is part of data quality. "Fine-grained," highly detailed data is necessary for both business and public applications. The data should be disaggregated, allowing for analysis by a number of different variables. It's also important that the data include information on all parts of the population. The UN Data Revolution[97] report notes that indigenous people and slum dwellers are often underrepresented or missing from national data. The report recommends that, within the limits of privacy and data quality, Open Data on any population should include descriptors of geography, wealth, age, gender, and other factors.

- **Protect privacy rights.** While fine-grained data has the most value, data that is too specific can put privacy rights at risk. Governments need to be aware of this risk and ensure that none of the

95   Stott, "Open Data for Economic Growth," World Bank, 2014. http://www.worldbank.org/content/dam/Worldbank/document/Open-Data-for-Economic-Growth.pdf

96   http://www.undatarevolution.org/wp-content/uploads/2014/11/A-World-That-Counts.pdf

97   Ibid.

data released – not just in sensitive areas like healthcare or financial status – can be connected with specific individuals. A developing array of technical approaches to this kind of anonymization can be helpful.

- **Provide sufficient data about the data.** The need for clear, consistent, and useful metadata – "data about data" - has been recognized by Open Data programs around the world. As governments release more Open Data, they need to provide the tagging and information that will make the data as useful as possible. This includes not only metadata but information about the ways the data has been collected, its timeliness, any known quality issues, and other factors that may affect how it is used.

Conclusion

Open Data can help countries around the world address a wide range of development goals. It is an essential, versatile resource that can increase trust in government, boost economic growth, create jobs, and improve essential products and services. As the Sustainable Development Goals are being set, countries across the globe can look to Open Data as a ready means to help meet them. Open Data can help improve food security, healthcare, education, cities, the environment, and other public and private services that are critical to development.

It's become common to observe that data itself has no value: The value comes from how data is used. To realize that value, governments need to do more than release Open Data in usable formats. They need to engage with their data users in a meaningful dialogue, creating Open Data programs that are driven by the demand for data and not only by its supply.

As the world becomes more data-savvy, governments have myriad opportunities to work with the private sector, NGOs, and developer communities in their countries. New collaborations and partnerships can help create new business opportunities, better public services, and innovative ways to improve the lives of millions of people. Through dialogue, collaboration, and joint problem-solving, governments and their data users can realize Open Data's potential as a powerful resource for generating social and economic value.

Annex 1: Open Data for Sustainable Development Goals (SDGs)

Sustainable Development Goals (SDGs)[98]	Open Data Solutions
1. End poverty in all its forms everywhere	The government provides information about public goods and services so that people living in poverty will have access to basic care.
	The use of Open Data drives business growth and thus the creation of new job opportunities.
	Open Data that can be used to match job-seekers with employers can help increase national employment overall.
2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture	The release of agricultural and nutrition data promotes better education of farmers and ordinary consumers.
	The use of Open Data can help counter local problems that interfere with agriculture like unfair subsidies, disease or theft.
	Open Data can help correct erratic food prices - a potentially serious problem in low-income countries where food can be scarce.
3. Ensure healthy lives and promote well-being for all at all ages	Open Data can be structured into an effective tool for connecting potential patients to the optimal providers of healthcare.
	Practitioners can use Open Data to make healthcare more efficient and reduces the costs.

	Open government data combined and supplemented with crowdsourced and other nongovernmental data can also be critical in tracking infectious disease.	
4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	Many countries are now using open government data and other data to show the availability and improve the quality of public schools.	
	Open Data about basic school operations and facilities helps to inform policy makers about failures in schools and students' education.	
5. Achieve gender equality and empower all women and girls	Analysis of Open Data can highlight disparities in the ways that education and health systems cater to women and girls.	
	Open Data on proper sanitation provision and the establishment of water points attached to or near schools will save many hours of time for young girls, who otherwise would not have had the opportunity to attend school/invest in a career.	
	Open Data on health care and education facilities can provide young women and girls with resources (specifically in sexual and maternal health).	
6. Ensure availability and sustainable management of water and sanitation for all	GPS and satellite imagery Open Data can be used to map out communities and infrastructure to plan the placement of water and sanitation points.	
	Open Data on water quality can help for quicker clean-up/sanitation service responses.	
	Open Data can also be used to identify areas that are undergoing a water supply crisis.	
	Open Data about urban low income areas can be used to create development and sanitation programs aimed at the reduction of water & sanitation-related public health risks.	

7. Ensure access to affordable, reliable, sustainable, and modern energy for all	Open Data on competing electric utility services can be used to provide the best price points to consumers.
	Open Data from household energy surveys, satellite imagery, and other sources can help governments and private companies prioritize investments in energy generation and grid extension.
	Open Data can support the development of renewable energy sources strategically and efficiently.
8. Promote sustained, inclusive, and sustainable economic growth, full and productive employment and decent work for all	Open Data can be used as a tool for training young people in the technology skills that can lead to successful employment
	The provision of Open Data can be the raw material for innovative new data-driven businesses
	Open Data helps existing companies optimize their businesses
	Open Data can also be a means to helping individuals receive the initial financing needed to launch a company
9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	Open Data is the prospect of rethinking urban infrastructure through "smart cities." The concept of smart cities involves combining government-provided Open Data with extensive, diverse, and timely data collected from sensors around the city that measure traffic, air quality, and other factors.
	Open Data is being used to understand urban issues and improve urban planning.
	Open Data can improve transportation systems/infrastructure.

10. Reduce inequality within and among countries	Open Data promotes greater transparency in governance to reveal inequality and support action to correct it.
	Open Data informs domestic economic regulations to best provide for those living on social welfare or for those living near or below the poverty line.
11. Make cities and human settlements inclusive, safe, resilient, and sustainable	Some of the most effective applications of Open Data - not only government data, but also data gathered from citizens - have been in managing disaster risk and relief efforts.
12. Ensure suitable consumption and production patterns	Open Data can be used to track consumer prices on a global scale, and in real-time, spot early signs of food shortages, inflationary pressures, and detecting other important trends and anomalies for better decision-making.
13. Take urgent action to combat climate change and its impacts	Open Data programs are designed to help cities and countries become more resilient in the face of climate change, and the floods, droughts, and other extreme events that may ensue.
14. Conserve and sustainably use the oceans, seas, and marine resources for sustainable development	Open Data can prove to be a useful way to monitor volume of fishing intake in national/supranational waters to ensure proper compliance with sustainable sourcing.
	Open Data on various marine activities can potentially lead to the discovery and usage of marine energy sources such as geothermal vents etc.

15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	Major national and international data programs are now addressing climate change and other fundamental environmental issues.
	Open Data on mining, drilling, and energy industry practices help promote transparency that will prevent bad practices out of fear of public reaction.
16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels	Open data has helped several countries to launch spending transparency initiatives - often for their own internal controls and at least as much for their international reputation.
	Open Data on budgeting and elections promote greater transparency in political institutions and can consequently encourage greater political involvement.
	Open contracting - making government contracts available for public review - deters favoritism and hidden deals, and simultaneously benefits government, businesses, and investors.
17. Strengthen the means of implementation and revitalize the global partnership for sustainable development	Open Data can be used by sovereign nations to collaborate on and implement solutions that have global benefits.
	Open Aid Data on developing countries can allow for more efficient allocation of foreign aid resources and support for sustainable development in less developed countries.

Annex 2: Open Data and the U.N. Data Revolution

This Annex describes how Open Data can support the goals of the U.N. Data Revolution for Sustainable Development. It refers to points and recommendations made in the U.N. report on the Data Revolution, *A World That Counts.*[99] While that report mostly addresses the use of national statistics, it is relevant to Open Data more broadly as well.

A major theme of the report is that "the data revolution can be a revolution for equality." This goal itself is closely related to the goals of Open Data programs around the world. Many global Open Data programs address job growth, health care, food security, government transparency, and other concerns that are essential to creating more equitable societies.

In the examples below, sections in roman lettering are quotes from the report, while those in italic are examples of ways that Open Data and World Bank Open Data programs can help meet the report's goals.

Problem addressed by the report: "Too often, existing data remain unused because they are released too late or not at all, not well-documented and harmonized, or not available at the level of detail [and quality] needed for decision-making."

Goal of the report: "To set out the main opportunities and risks presented by the data revolution for sustainable development."

Call for action/key recommendations:

- Develop a global consensus on principles and standards: Establish a "Global Consensus on Data" to standardize the principles in reporting, legal, etc.
    - *The principle of "Open Data by Default" can be the first step towards setting a global standard of quality and format for open government-released data.*
    - *The experience of several World Bank client countries provides examples of the benefits of standardization in developing actionable Open Data programs.*

- Share technology and innovations for the common good: Create a global "Network of Data Innovation Networks," to bring together organizations and experts in the field.
    - *Open Data Portals can be an excellent medium for thought exchange as part of this "Network of Data Innovation Networks."*
    - *The nature of Open Data includes an element of collaboration and innovation for the common good as many Open Data products are released to the public to be used, iterated upon, and improved.*

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99   Independent Expert Advisory Group on the Data Revolution to the United Nations, A World That Counts: Mobilising the Data Revolution for Sustainable Development, November 2014.

- New resources for capacity development: Find "a new funding stream" to support the data revolution for sustainable development.
    - *The report states that "an assessment will be needed of the scale of investments, capacity development and technology transfer is required," which should include an assessment of Open Data as provided by the Open Data Readiness Assessment.*
    - *The report notes a need for funding "to implement an education program aimed at improving people's, infomediaries' and public servants' capacity and data literacy," which can partly be done through data workshops and hackathons that are part of many Open Data initiatives.*

- Leadership for coordination and mobilization: Create a "Global Partnership for Sustainable Development Data" to mobilize and coordinate actions & institutions [to include] a "World Forum on Sustainable Development Data" [and] a "Global Users Forum for Data for SDGs" to ensure feedback loops between data producers and users
    - *These forums/partnerships can draw on Open Data from many sectors of the economy and society.*

- Exploit some quick wins on SDG data: Establish a "SDGs data lab" to support the development of a first wave of SDG indicators, analysis, and visualization platforms
    - *As Annex 1 shows, Open Data can be a significant resource in meeting the SDGs through data labs and other approaches.*

Basic Principles for the Data Revolution for Sustainable Development:

1. Data Quality and Integrity:

    Open Data exposes data to public view in a way that allows for crowdsourced review and quality control.

2. Data Disaggregation:

    Open Data has many elements of being disaggregated and being highly accessible to many or even any party that wishes to use it.

3. Data Timeliness:

    Open Data allows for private-sector and citizen contributions to open datasets that can make data more timely and relevant.

4. Data Transparency and Openness:

    This tenet can be directly linked to Open Data and its promotion of transparency and tightened feedback loops between data users and data suppliers (namely government).

5. Data Usability and Curation:

    Through Open Data Roundtables and similar events, data users can provide feedback on open datasets that makes them more accessible and useful.

6. Data Protection and Privacy:

    The challenge of opening datasets while anonymizing sensitive information on health, finance, or other PII sets a high bar for developing data privacy safeguards.

7. Data Governance and Independence:

    The Open Data Charter, Open Government Partnership, and other international efforts are beginning to provide a governance structure for Open Data.

8. Data Resources and Capacity:

    This is directly in line with the recommendation for "new resources for capacity building". Open Data assessments and the implementation of Open Data Initiatives help client countries develop their ability to produce "high-quality statistics in line with global standards," and to consequently disseminate this data to the private sector/non-profit sector.

9. Data Rights:

    The entire concept of Open Data is based on, and reinforces, the fundamental right for the public to have access to key datasets.