DKSR
Data Competence for Cities and Regions

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INTRODUCTION

Benefits of data-based solutions: Create and measure real value

This introduction shows you how other cities have created concrete benefits and value by implementing data-based solutions.

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Building a case for data-based solutions: Measuring and quantifying benefits

Data-based solutions can help cities meet some of their greatest challenges, pave the way to better public services and spaces, and increase quality of life. Cities generate huge amounts of data every day. This data can be the key to unlock innovation, feed technological solutions, and provide valuable insights for better decision-making processes.

There are as many solutions as there are challenges across the different aspects of city life, and each brings different benefits: from increased convenience in the everyday life, to better environment, health, and safety. These benefits can sometimes be hard to quantify. Still, decision makers, city officials and policy makers often need to carry cost-benefits analysis to build the case for and justify the investments in data-based solutions. When doing so, it is important to consider that solutions often bring benefits on more than one aspect of city life. A solution designed to reduce traffic might have an impact on emissions or road safety, smart irrigation might lead to water savings and cooling effects. City officials should be aware of these synergies and co-benefits when demonstrating the full positive benefits of solutions.

Data-based solutions can play a key role for cities looking to advance the Sustainable Development Goals and have the potential to significantly improve key indicators across all urban domains, sometimes by as much as 10 to 30 percent. Different studies have been carried to assess the concrete benefits of digital interventions and solutions. One study found that deploying a range of urban applications to the best reasonable extent could, on average, cut greenhouse gas emissions by 10 to 15 percent, lower water consumption by 20–30 percent, and reduce the amount of unrecycled solid waste per capita by 15 to 20 percent. Depending on a city's characteristics, this could mean 30 to 130 fewer kilograms of unrecycled waste per person each year and 25 to 80 liters of water saved per person every day. [1]

This document aims at portraying some of the benefits associated with data-based solutions across some selected domains of city life. It provides concrete examples on the benefits that some cities have achieved. Specifically, we investigate practices on safety, utility provision (energy, water), environment (air), mobility and community.

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Energy

Gathering data and analysing it can dramatically reduce the **usage of energy**. Automatic systems (like smart appliances) can optimize the usage of energy that otherwise often gets wasted in homes and commercial buildings in heating, cooling, and lighting. Dynamic electricity pricing, consisting of charging consumers different rates in accordance to peak times of consumption, is another way in which cities are tackling their energy consumption. It has been shown that dynamic pricing can reduce emissions by up to 5 percent. Technologies like sensors to track energy demand and the analysis of energy data create new opportunities to save energy and money. Some cities have already used this approach. One example come from Wellesley, US: by managing and reporting regularly on energy use for each town building and benchmarking the results, the town **reduced energy use by nine percent** over a three-year period, even with 37 percent rise of extreme weather days, for a total **avoided cost of $132, 000** [2].

Another way in which cities can create benefits and improve their energy consumption comes from the incorporation of smart infrastructure. The Barcelona Lighting Masterplan uses smart technologies to enhance the efficiency and utility of city lampposts. In addition to transitioning the existing lampposts to energy saving LED lights, the city reduced energy consumption by using smart lampposts that could sense when pedestrians were in close proximity. When the streets are empty, lights are automatically dim. These improvements led to **30% energy savings** across the urban lighting system. Through smart lighting, the city reports **saving an additional $37 million annually** [4].

Safety

From emergency response to more efficient safety inspections, data can be used to better deploy **resources and personnel** for **more secure cities**. Data-based solutions can significantly improve emergency response times: a city with an average response time of 50 minutes might be able to shorten that by more than 17 minutes [1]. An instance of this is the city of New York. By using data analytics to streamline the process of assignment of 911 emergency calls including the call type, historical data, weather, and location of the incident, delays in getting patients to hospitals were reduced by 22 percent. Not only that, but the insights given by the data were used for a better allocation of scarce resources and first responders.[2] When it comes to natural disasters (e.g. earthquakes, flooding), giving citizens as much warning time as possible can enable them to take precautions and/or evacuate, and can be crucial for saving lives. Advances in storm-tracking and weather prediction modelling have greatly improved early predictions on the paths of storms or potential flooding. Estimates show that in Europe, over 20 years, every Euro invested in Flood Awareness System (EFAS) **returned 159 Euros** [3]. On the other hand, the systems implemented in

Mexico and Japan for early warning for earthquakes can give residents as much as **minutes to get to safety** [1].

Mobility

Most cities have some data available on their **transit and mobility systems**, and this can be used to create a **wide array of solutions**. By 2025, cities that use smart mobility applications have the potential to cut **commuting times by 15-20 percent** on average[1]. In cities where large numbers of private vehicles are used, the biggest benefits arise from interventions that reduce road congestion, like intelligent traffic system, signals, and smart parking. Applications that encourage citizens not to drive their private cars can also decrease traffic. Some cities are already leveraging on data for their mobility efforts. For drivers, Barcelona has implemented a sensor system that guides them to available parking spaces. The sensors are embedded in the asphalt and can sense whether a vehicle is parked in a given location. By directing drivers to open spaces, the program has reduced congestion and emissions. The application that drivers use to locate parking also allows them to pay for parking online. Within a year of implementation, the city was issuing 4,000 parking permits per day through the application and increased its **parking revenues by $50 million per year** [4].

The benefits of smart parking approaches can be also seen in San Francisco, US, where smart dynamic pricing for city metered parking decreased the time spent looking for parking spaces by 43 percent, and violations for double parking dropped by 22 percent, results that improved both efficiency and public safety. The monetary benefit of the **increased revenue** attributable to the use of smart parking technologies was **$98.70 per parking space** [2]. Similarly, the introduction of smart parking and traffic control in Oslo **reduced car traffic** in the city centre by **11 percent** in the first two years and **19 percent** in the third year[5].

Milan has also used data to improve its mobility. It has implemented a smart traffic system that gives the possibility to have a clear view of motorized mobility in the city centre. The system also supporting models of forecast and provides data for sustainable mobility analysis. On this basis, road traffic and road accidents have been reduced by about 26-29 percent, and **public transport speed has increased by 2-5 percent** [6]. In Bologna, a mobility app was developed which rewards citizens for choosing public transport and soft mobility, leading to 7**3 percent of its users reducing their car use** and **77 percent declaring to walk more** [5].

Data from license plate recognition technologies also offer great potential. Stockholm used cameras that photograph license plates for its congestion charging system, and managed to reduce traffic by 20 percent, leading to substantial traffic decrease in and around the city [7]. Similarly, an on-street parking service that uses Automatic Number Plate Recognition in **Amsterdam** monitors more than 6 million vehicles per month, which resulted in **reduced fraud and improved vehicle turnover**. From this, **€250 million have been collected** for the city of Amsterdam,

and a **60-80 percent decrease in parking fraud** has been achieved [8].

Air

In the last decades, cities around the world have continuously struggled to **reduce pollutants** in the air that we breathe. Data is helping cities in the measuring, management, and improvement of air quality. The approaches of cities vary: Cities like Chicago and Beijing have implemented citywide sensor networks to allow city officials to make decisions based on real-time data. Beijing for example, achieved a **reduction of deadly airborne pollutants by roughly 20 percent** in less than a year by closely tracking the sources of pollution and regulating traffic and construction accordingly [9]. Furthermore, research shows that sharing real time air quality data with the public via smartphone apps enables individuals to take protective measures, potentially **reducing negative health effects by 3–15 percent**, depending on current pollution levels [1].

Water

Cities can **improve water services** by **implementing smart water management and analytics**. Using "smart meters" and sensors, real-time information on water flow can be tracked and measures on management and conservation can be implemented. Water consumption tracking has the potential to **reduce consumption by 15 percent** in high income cities with high consumption in residencies[1]. Some cities have already started demonstrating the potential of these solutions. Using the slogan "If you can't measure it, you can't manage it!", Washington uses data analytics to identify potential leaks or plumbing problems by looking at water flows, historical data, and identify spikes in consumption. This way, they can send **alerts to customers** who could be having a problem such as a leak and avoid wasting water [10] .

Another example comes from Barcelona that has used IoT technologies to remotely sense and manage park irrigation and water levels in public fountains and maximize efficiency. Park workers can determine how much irrigation is needed in each area by using sensors to monitor rain and humidity. The necessary water is delivered across the city using a system of electro valves that are controlled remotely. This measure has been implemented in 68 percent of public parks and helped the city achieve a **25 percent increase in water conservation**. It accounts for **savings of approximately $555,000 per year** [4] .

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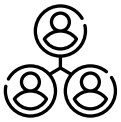

The community benefits of data-based solutions are hard to quantify, but a study surveying urban citizens found that digital applications can make people **feel closer to their local governments and communities**. The use of apps and digital platforms could increase the feeling of connectiveness as they make it possible for users to interact with their immediate communities and local governments. This is a central challenge of the smart city, as the constant engagement with technology could also bring isolating effects. Before using digital applications, only 13 percent of those included in the survey felt some

sort of connection to their governmental institutions and community, but that number **significantly improved by about 25 percent** after using the channels. Another interesting find is, that those citizens who start engaging with these apps often report the desire to continue engaging in the future, as they predict these channels will become more important in their everyday lives [1].

After a decade of experimentation, market solutions and pilot projects, data-based solutions have demonstrated that they can bring multiple benefits to cities. Even though these solutions are not the only element to making a great city, they can be cost effective, powerful approaches to add. Do you want to learn how to incorporate digital solutions to your city and reap the benefits of working with data? We'll show you how it's done! Feel free to contact us at any time - via square@dksr.city!

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