

Prosperity Fund

GLOBAL FUTURE CITIES PROGRAMME

RECIFE

CITY CONTEXT REPORT



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Global Future Cities Programme
RECIFE
City Context Report

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FUTURE CITIES PROGRAMME

Introduction

ABOUT THE GLOBAL FUTURE CITIES PROGRAMME

In 2015, the UK government created a new Cross-Government Prosperity Fund worth £1.3 billion from 2016-2021, in order to help promote economic growth in emerging economies. Its broad priorities include improving the business climate, competitiveness and operation of markets, energy and financial sector reform, and increasing the ability of governments to tackle corruption.

Emerging Economies still face considerable challenges such as uncontrolled urbanisation, climate change and high and persistent inequality which can lower long-term growth prospects. The Prosperity Fund supports the broad-based and inclusive growth needed to build prosperity and reduce poverty, but also make development overall more sustainable through the strengthening of Institutions and Improvement of the global business environment.

The Global Future Cities Programme (GFCP) is a specific component of the Prosperity Fund which aims to carry out targeted interventions to encourage sustainable urban development and increase prosperity whilst alleviating high levels of urban poverty. The programme will also create significant short and long-term business opportunities in growing markets, forecast to be regional growth hubs, including for UK exporters who are world recognised leaders in urban innovation.

The overall strategy of the Global Future Cities Programme is to deliver the Programme in two phases; a strategic development phase (2018), followed by an implementation phase (2019-2021). UN-Habitat, in collaboration with the International Growth Centre (IGC) and the UK Built Environment Advisory Group (UKBEAG), has been mandated by the UK Foreign and Commonwealth Office (UK FCO) to develop and undertake the strategic development phase. This in turn, will inform and shape the implementation phase,

and collectively provide further evidence for the overall programme.

The Programme builds upon a coherent series of targeted interventions in 19 cities across 10 countries, to support and encourage the adoption of a more sustainable approach to urban development. In general, the proposed interventions aim to challenge urban sprawl and slum developments, thereby promoting more dense, connected and inclusive cities that in combination contribute to prosperity, achieving the Sustainable Development Goals (SDGs) and implementing the New Urban Agenda (NUA).

The Global Future Cities Programme builds upon three integrated pillars, that will address key barriers to prosperity, in selected cities:

- **Urban planning** – technical assistance for spatial restructuring (Public space, Heritage and urban renewal, Urban strategies and plans, Data systems for integrated urban planning);
- **Transportation** – technical assistance to support cities to develop integrated transport systems (Multi-modal mobility strategies and plans, Data systems for multi-modal mobility);
- **Resilience** – technical assistance to develop strategies to address the impact of climate change and ensure development is sustainable (Flood management plans and systems).

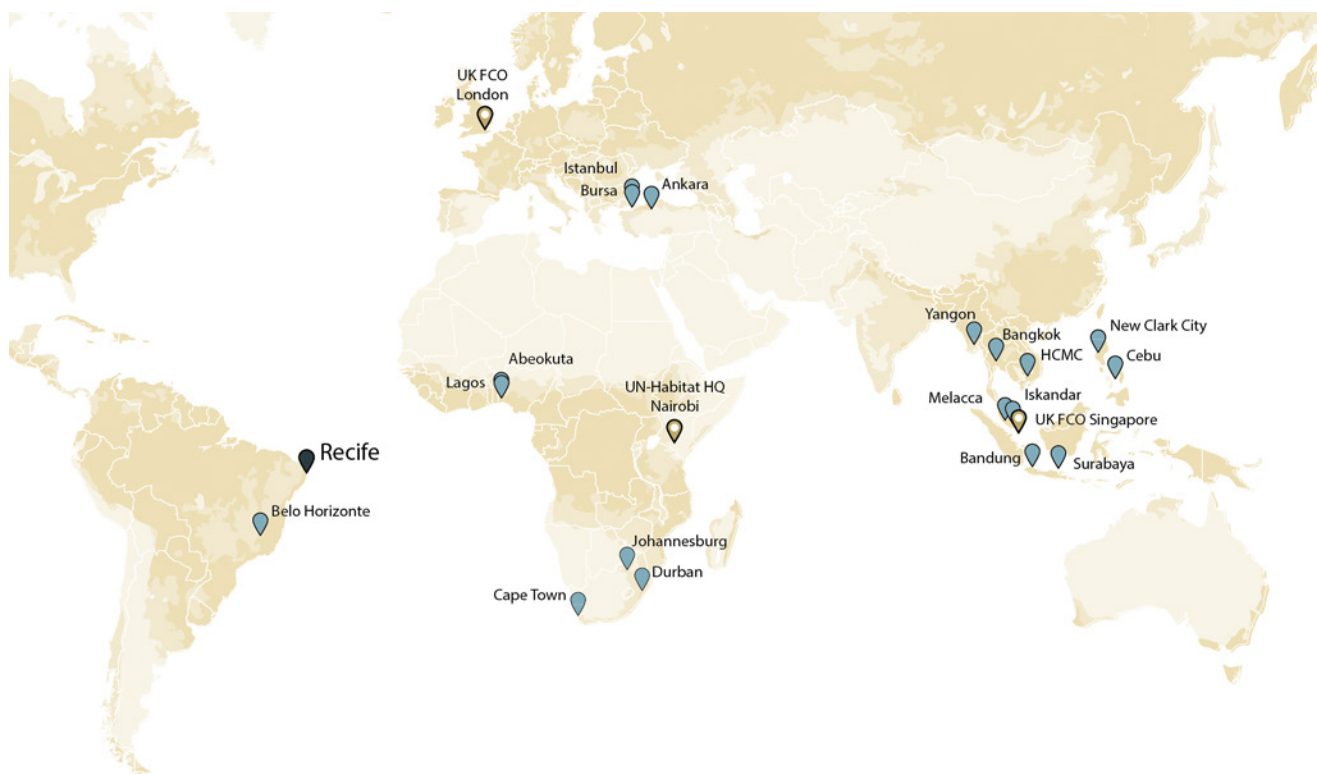
In order to capitalize on the proposed interventions and to ensure sustainability and impact in a longer-term perspective, the programme has a strong focus on technical support and institutional capacity development.

In many of the interventions, there is a particular focus on the potential of embedding smart/digital technology and data analysis platforms in urban governance and management processes. Integrating smart technologies is recognized as an instrumental area that significantly can improve the efficiency in the provision of key infrastructure services, enhance urban resilience, support evidence-based plans and strategies and promote integrated planning approaches across sectors.

INTERVENTION DEVELOPMENT AND VALIDATION

Based on initial scoping studies and government-to-government engagement carried out by UK FCO, the UN-Habitat team worked with partner local authorities and wider stakeholders to corroborate their city development strategies, and to confirm, enhance and develop the intervention proposals.

In each city, a Local City Specialist, supported by the national and regional country offices of UN-Habitat



and in liaison with the FCO local posts, took the lead in identifying stakeholders in a series of bilateral meetings, interviews and focal group discussions. This has collectively gathered information and provided more detailed knowledge and information on the City's visions and goals.

Based on this initial phase, a Charrette (planning workshop) involved high-level decision-makers from the public and private sectors together with civil society representatives. This facilitated discussion on the proposed and possible alternative interventions, related individual interests, technical opportunities and constraints, as well as political objectives. The outcome of the Charrette provided clarity on where stakeholders stand in relation to the strategic potential of the discussed projects and it allowed for the mobilisation of support.

At the same time, the Charrette allowed for the technical teams to proceed with the development of a Terms of Reference, outlining the specific scope and activities of each intervention. A final Validation Workshop assured consensus on the proposed projects and document's endorsement by the authorities.

Parallel to preparing the Terms of Reference, an evaluation of the interventions was initiated, aiming to address its feasibility within the local strategic context, identify potential impact on prosperity barriers and to explore the optimal delivery models. This process resulted

in a set of City Context Reports as well as an analysis of the technical viability of the interventions. The analysis aimed at both informing the development of the Terms of Reference and the future implementation phase of the Programme.

THE CITY CONTEXT REPORT

Objectives

A City Context Report is provided for each city of the Global Future Cities Programme. It serves as a tool to frame the proposed Programme interventions within the characteristics and pre-conditions of each city.

The Report targets a variety of stakeholders in the Programme: administrators, city managers, policy makers, legislators, private sector actors, donors, and local as well as international researchers and knowledge generators. The Reports also provide UKFCO the contextual setting of each proposed intervention, and can in addition, be used by the Service Providers as an entry point for the implementation phase.

By addressing the specific challenges facing each city, the Report illustrates how the interventions can work towards inclusive prosperity and sustainable urban development. The benefits of each intervention, however, cannot be achieved without certain enabling conditions to ensure its success. Therefore, critical aspects for the delivery of the proposed interventions and its success from a long-term perspective are outlined. Using thematic

best practices and evidence from global learnings and research, contextualised recommendations are provided on the conditions necessary for the intervention to be viable and to reach a maximum impact.

Essentially, the City Context Report serves to ensure that all actors within the Global Futures Cities Programme are aware of the specific conditions to be considered in the delivery of the proposed interventions, on a case-by-case basis.

Set-up and Scope

The first part of the City Context Report (General Overview) provides an overview of the Global Future Cities Programme and introduces the city from the perspective of the urban challenge which the proposed intervention intends to address.

The second part of the Report (Urban Analysis) more critically and technically analyses a selection of factors which need to be considered or to be in place for the intervention to succeed, addressing its feasibility, potential impact on prosperity barriers from a long-term perspective.

The third part of the Report (International Alignment and Technical Recommendations) presents short- and mid-term expected outcomes as well as long-term potential impacts. It further elaborates the contribution of the intervention to the achievement of the SDGs and the implementation of the New Urban Agenda as well as the programme objectives of the Prosperity Fund.

As the City Context Report is tailored directly to the Programme interventions, the analysis does not aim to comprehensively present all aspects of urban development. It does not elaborate on long term planning and transformation strategies, the effectiveness of policy or urban legislation, nor the entire municipal financial system. As such, it also excludes urban policy recommendations.

However, the Report has the scope to illustrate the general capacity of the city for project delivery, and in this regard, make recommendations to support implementation of the interventions and reaching set goals. The City Context Reports will be part of knowledge management for the Programme to generate local information and data on the cities as well as identify gaps in knowledge, systems or governance.

Methodology

Urban Analysis

The City Context Report provides a general analysis of the spatial, financial and legal conditions in the city that

can either facilitate or hinder the implementation and the long-term sustainability of the proposed interventions in transport, resilience and urban planning.

This framework follows UN-Habitat's three-pronged approach, recognising the three essential components for a successful and sustainable urbanisation: 1. urban planning and design; 2. urban economy and municipal finance; 3. urban legislation, rules and regulations.

Firstly, the spatial analysis describes the existing urban context specific to the intervention. Urban mobility systems, vulnerability of the built environment, spatial form and trends are considered as possible challenges in urban management that the intervention can address.

Secondly, the financial analysis aims to identify the mechanisms in place by which the intervention could be sustainably financed in the long-run. This section outlines the city's municipal capacity, existing regional, national and international financial ecosystem and existing financing mechanisms at the municipal level.

Thirdly, from a legal perspective, the Report critically analyses how the intervention could be facilitated or challenged by the vision of the city and its governance hierarchy. Enablers and obstacles resulting from any relevant legislation, as well as sectoral frameworks (e.g. strategies, policies, planning frameworks and development plans, detailed plans of relevance) are also described.

This approach aims to offer implementing partners, stakeholders and donors a general context of the city and, with it, demonstrate the appropriateness of the intervention from a spatial, financial and legal point of view, while at the same time informing about potential barriers and enablers for its implementation.

Potential Impact to the Program Objectives and the SDGs

The Report also outlines the potential impact of the interventions, based on the specific activities and outputs proposed. Impact can arise from a complex interaction of context-specific factors, rather than as result of a single action, which makes it difficult to empirically quantify longer-run effects that go beyond the identification of program outputs. An empirical, comprehensive impact assessment is therefore not part of the scope of this report.

Nevertheless, the report outlines potential benefits that are only achievable under certain preconditions and activities. Thereby, short-, medium- and long-term outcomes are defined with reference to a project-cycle approach, which considers all the project phases from



Planning and Design through Building, to Operating and Maintaining.

Short-term outcomes are directly achieved through the implementation of the technical assistance support, within the 2-3 years scope of the Global Future Cities Program.

Mid-term outcomes are only realised once the intervention is executed through either capital investment, implementation of pilot projects or the actual enactment of legal documents, plans or masterplans, within a possible timeframe of 3 to 7 years.

The broader long-term impact of the interventions is linked to the sustainability of the interventions in a 7-15 years timeframe and relates to the operation and maintenance phase of the project cycle.

The City Context Reports further connect potential impacts to the Programme's objectives, taking into account also the Cross-cutting issues at the core of UN-Habitat's mandate from the UN General Assembly. Consequently, the Programme's objectives are summarized into five principles:

- Climate Change;
- Gender Equality;
- Human Rights;
- Youth;
- Sustainable and Inclusive Economic Growth.

Cross-cutting issues are addressed with explicit reference to the 2030 Sustainable Development Goals (SDGs) and the New Urban Agenda, in an attempt to ensure that the proposed interventions are in line with the design, implementation, review and success of the 2030 Agenda for Sustainable Development. Consistent with UN-Habitat's mandate, the SDG 11 Sustainable Cities and Communities is linked with the urban dimension of the other 16 goals as an essential part of the localisation of the SDGs. In this way, interventions can support localisation processes, to support local ownership and ensure SDG integration in sub-national strategies and plans.

Technical Recommendations and International Best Practices

The interventions proposed in the various cities of the Global Future Cities Programme were grouped into clusters according to their thematic entry-point, as an elaboration of the thematic pillars of Urban Planning, Transport and Resilience.

These clusters are:

- Public space
- Heritage and urban renewal
- Urban strategies and plans
- Data systems for integrated urban planning
- Multi-modal mobility strategies and plans
- Data systems for multi-modal mobility
- Flood management plans and systems

Combining the international experience in urban policy and project implementation of UN-Habitat and the leading academic research of IGC, each cluster was analysed to offer evidence-based recommendations for a successful Implementation and a maximised impact of the intervention. Specific reference was given to implemented plans and international best practices.

The recommendations inform the Planning and Design phase which coincides with the timeframe of the Global Future Cities Programme, and always aim for long-term sustainability of the interventions.



Fig. 1. Recife Skyscrapers' View (Source: Francesco Tonnarelli, UN-Habitat)

Recife

GENERAL CONTEXT

Recife is a coastal city located in the northeast region of Brazil. With a population of 1.5 million inhabitants, it is the ninth largest city in Brazil.¹ Recife is the major city on the Recife Metropolitan Region (RMR), which is composed of 15 municipalities (Goiana, one of the 15 municipalities, joined the administrative region in 2018). According to the last census, RMR is the sixth-largest urban agglomeration in Brazil and the biggest of the north and north-east region.²

Recife is the capital of the State of Pernambuco and is its political, financial, educational and cultural centre. With the presence of an international airport and port, Recife has a comparative economic advantage in

transport and telecommunications. It is considered a hub for the creative economy and is one of the most business-friendly cities in Brazil.³ Its most relevant asset is ICT, in which both the city and state are investing in the strategic sector. Hundreds of technology companies and entrepreneurs are located in its business incubators and innovation centres and its technological park, Porto Digital, has become one of the economic centres of Pernambuco.⁴ This is also mirrored in the wider population: internet access operates at an average rate of more than 70 per cent, with an average rate of 50 per cent among the lowest-income population.⁵

Despite Recife's strong and innovative economy, more than 40 per cent of its population is in poverty. According to the Brazilian Institute of Geography and Statistics (IBGE), in 2010 some 852,700 people were living in favelas lacking adequate infrastructure and services.⁶

This chaotic process of urbanisation over the years has resulted in increased exposure to floods and natural disasters, creating social and economic losses and occasional losses of life. Urban mobility is also a challenge for Recife and its metropolitan region in terms of congestion and poor quality of public transportation services.

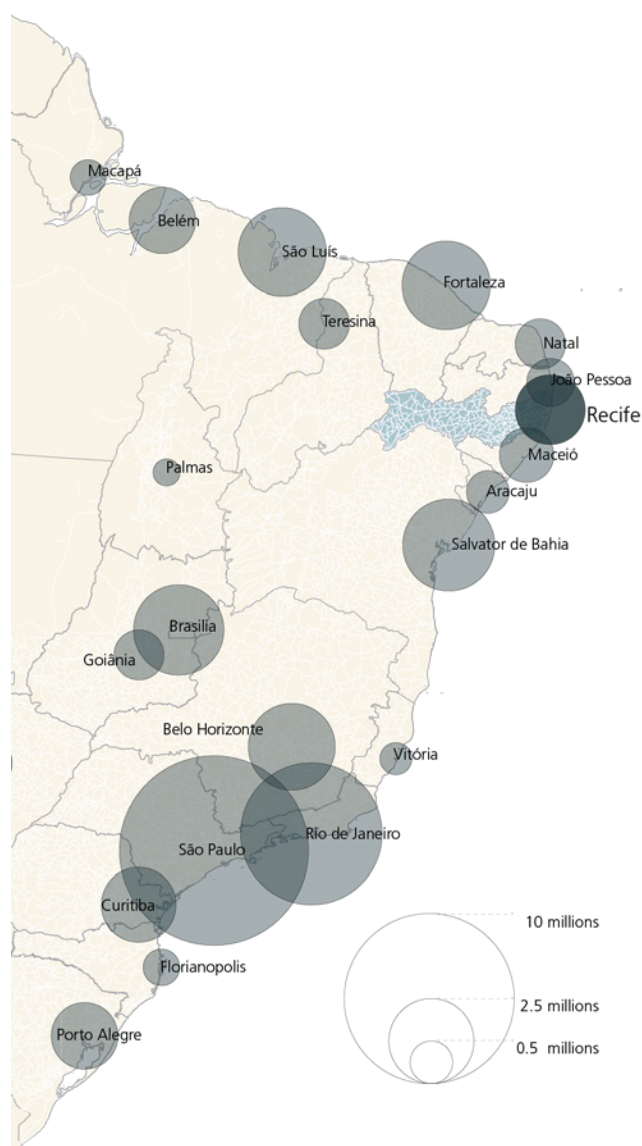


Fig. 2. Pernambuco and Brazil State Capitals by population

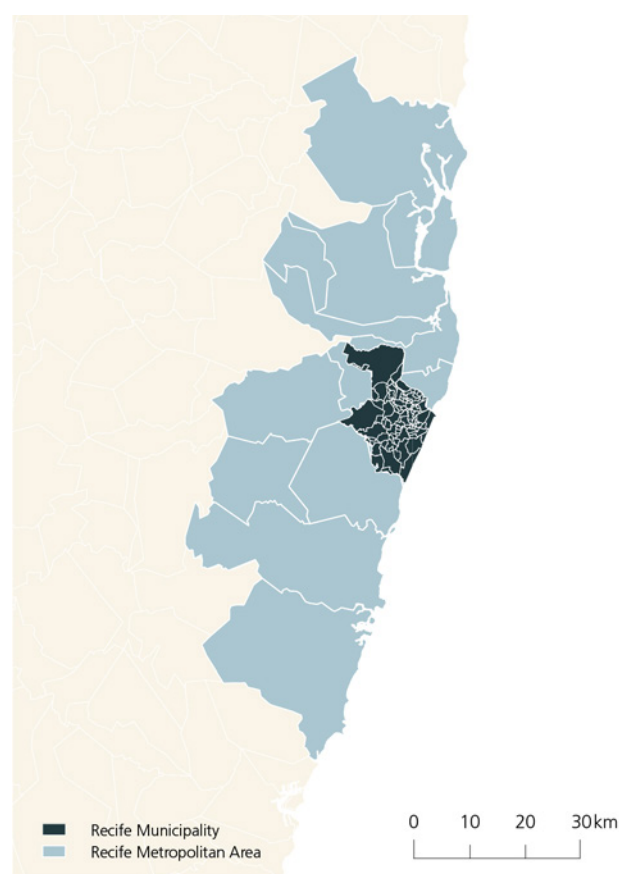


Fig. 3. Recife Metropolitan region



Fig. 4. Recife aerial view (Source: Wikipedia)

PROBLEM STATEMENT

The Municipality of Recife aims to be a forward-looking, resource-efficient and integrated city that delivers quality services to its residents. However, many citizens still live chronic stress due to high unemployment, poverty, crime and traffic congestion. The current Brazilian economic and financial context has put Recife, along with all other sub-national capitals, in a serious and urgent situation due to budget constraints. This has forced the municipalities to adopt innovative approaches in dealing with tough control of public expenditures, while maintaining the quality of service. Data plays a critical role in how evidence-based decisions are made and how evidence-based policies, strategies, plans and implementation programmes are developed.

Recife is a national leader in ICT but this has not led to an institutionalised integration focused on effective deliveries of solutions applied to the city as a long-term cultural legacy.

Open Data (OD), transparency and participation belong to an emerging and well-known agenda for the local government but this has been predominantly addressed through punctual and isolated actions such as transparency portals, information access portals, communication channels in social networks, open data repositories and so on. Although some of these initiatives have been nationally top-awarded, they have been

fragmented and not strategised in the kind of long-term prospective which could evolve into actions to promote social, economic and environmental sustainability.

From the municipality's side, there is a lack of capacity in dealing with these issues efficiently. Changes and new demand take place at a much faster pace than the dynamics of public management practices can provide. Meanwhile, federal and local laws and regulations demand transparency and citizen participation on the municipality management as positive practices against corruption and administrative improbity.⁷

From the citizens' perspective, there is a growing demand to gain access to free public data, government data scrutiny, more engagement and participation channels, evidence-based public policy making, innovation and knowledge development push.⁸

INTRODUCTION TO THE INTERVENTIONS

The action of the Global Future Cities Programme aims at building a more transparent, evidence-based driven, accessible and open city while tacking on innovation to build up an urban culture empowered by data.

The intervention proposed in the Terms of Reference is known as the Urban Governance Data Ecosystem (UGDE), which is a system of interactions between municipal

government and other stakeholders that exchanges, produces, and consumes data for better understanding, planning, financing, managing and living the city.

The objective of the UGDE is to provide an environment where data related to urban governance (urban planning, transport, resilience and economic analysis) are shared and used to inform key decisions around the planning for and design of a better Recife, as well as raise a better citizenry awareness on urban information.

More specifically, with the UGDE it will be possible to:

- Develop an application case study, data quality standards and matrices to improve data collection at various sources
- Improve data sharing within Recife and with external partners for accurate, evidence-based strategic planning uses related to the city
- Develop data models, tools and applications, techniques, capacity and systems for ongoing evidence building and analysis to support decisions linked to data

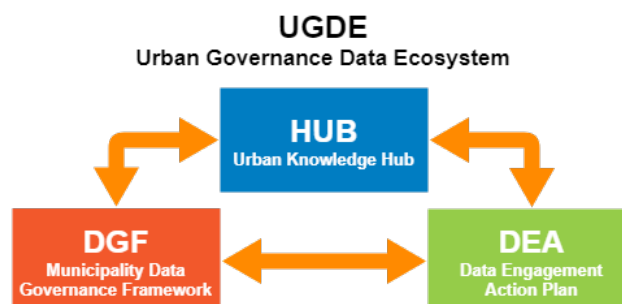
Beyond its potential as a tool for better urban governance, UGDE has been conceived as a virtual public space and citizen culture for involvement, which could achieve the following:

- Increase the capacity of the Municipality to collect, analyse and provide data
- Assure data availability and consistency for government, academia, private sector and civil society to promote participation, awareness, as well as opportunities for innovation and business
- Promote data literacy, information and knowledge sharing among the widest audience with an inclusive, adaptive, integrated and expansible interface and social practices

The main interconnected outputs for the UGDE intervention are:

- **Municipality Data Governance Framework (DGF)** – to ensure that data is high quality, reliable, and unique (not duplicated), so that downstream uses in reports and databases are more trusted and accurate
- **Urban Knowledge Hub (HUB)** – a common platform for open data sharing, connected through digital services, to deliver public services and enable the bases for the data revolution into local culture

- **Data Engagement Action Plan (DEA)** – a series of initiatives such as training sessions, coding courses, hackathons, seminars and congresses, meetings and community immersions for promoting the data literacy among all the citizens of Recife at various levels



Main Stakeholders

- DGF: EMPREL;
- HUB: ARIES;
- DEA: Porto Digital

Possible Project Partners

- Municipality (various public offices),
- Federal Universities (UFPE and UFRPE),
- State University (UPE),
- Private University (UNICAP)
- Federal Institute (FUNDAJ)
- Local NGO's

Thematic Cluster

Data systems for integrated urban planning

Keywords

Government accountability; Transparency; Open Data; Empowerment-by-data; Open Innovation; Data literacy; Citizen participation.

URBAN ANALYSIS

Spatial Context

URBAN FORM AND SPATIAL STRUCTURE

Historical Context

In 1537, on a hill north of the nearby colonial town of Olinda, sits the port Bairro de Recife, or Recife Antigo (Old Recife).

Around 1630, the Dutch established Recife as a trade centre, initiating its urbanisation with construction of bridges and embankments of the mangroves which has resulted in the narrowing of the city's rivers. The expansion of the city took place predominantly on landfills in tidal areas, on the coastal strips, and on the inland old sugar plantations. The land structure of Recife is still characterized by large stretches of *terrenos de marinha* or marine lands,⁹ which include the patchy and remnant areas of the old plantations that extend along the hills surrounding the plains of the city.

The city gradually organised its urban structure through radial connections from the initial core of the port. In addition to creating various agglomerations, these first axes formed the main roads and transport routes, still compose the concentric circulation system of the city today.

Following Rio de Janeiro, Recife was the second Brazilian city to operate steam trams and may have been the first in the world to operate steam locomotives built to run on the streets. Yet, from the 1950s onwards, following country-wide encouragement of automobiles as a political guideline and technical matrix for the circulation of goods and people, Recife consolidated its road mobility model. This caused an expansion of the road network and the city grew rapidly without proper coordination.

As with other Brazilian cities, the public transport system conceded to private enterprise, contributing to disordered urban expansion along the main lines

through the purchase of land and anticipating demands and defining expansion areas with low occupancy and insufficient provision of infrastructure.

Furthermore, processes of exclusion and spatial segregation began to confine the low-income population in areas of greater environmental fragility including the flood plains, the river and streams banks and the slopes of hills in the northern area of the city.

CURRENT URBAN FORM

Recife can be divided in four categories based on their land use, morphology and particular environmental characteristics (based on hills; plains; estuaries/rivers and coastal/islands). With reference to Figure 6:

A - The centre of the city, which is predominantly non-residential, is concentrated inside the first perimeter Av. Agamenon Magalhães, from where the routes that structure the living space depart. It has a significant presence of historical and cultural patrimony, as well as unoccupied buildings.

B - Two vectors where the main concentrations of vertical residential uses lie are Boa Viagem, along the south coast, and the Capibaribe river on the west. Since the 90s, and as maintained in the 2008 Master Plan, real estate development has been characterised in these two regions by a high concentration of buildings from 20 to 30 floors.

C - A third category represents the predominance of horizontal single-family residential use in the plains areas where services are located in key centralities or main axes. The only areas of medium and low population density involve Social Interest Communities (CIS), some already designated as Special Zones of Social Interest. (ZEIS).

D - Large patches of precarious occupations in the hilly areas in the north and in the plains in the south have a predominance of residential use of medium- and low-standard. They correspond to spontaneous occupations, and Zones of Special Social Interest (ZEIS), with limited infrastructure and discontinuity in the fabric which results in a lack of accessibility.

Zone of Social Interest

The dominant housing problem in Recife is characterised by the informal and precarious occupation in environmentally-fragile areas, notably in the those of permanent preservation along the rivers and canals in the city (the characteristic stilts houses) beside areas at risk of landslides. Settlements are relatively consolidated and characterised by the process of expansion, densification

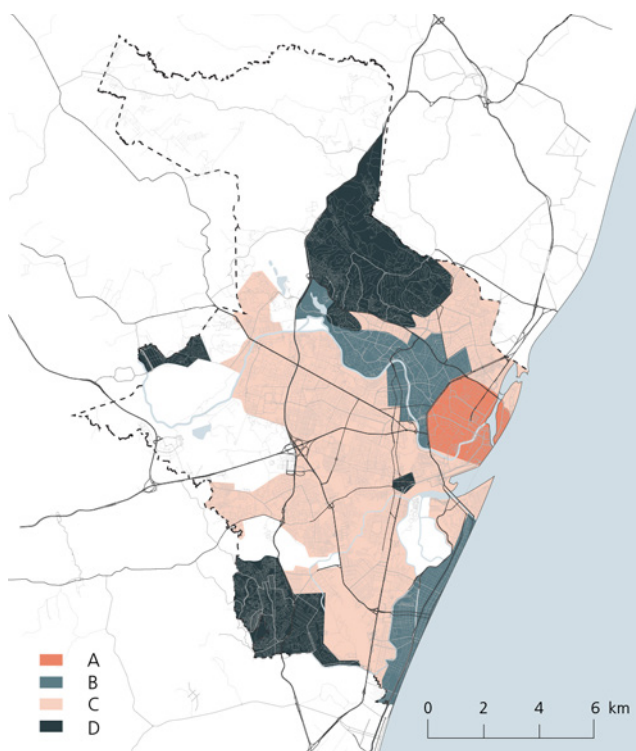


Fig. 5. Land use category in Recife

and verticalisation, which causes overloading of the existing infrastructure and consequent deterioration of the already-precarious conditions.

However low-income, often informal areas are wide spread across the whole city. Practically no neighbourhood is more than a mile from one of the city's favelas.¹⁰

The speed of urban densification and competition over urban land in recent decades has accentuated territorial disputes, resulting in increasing tensions between real estate market agents and irregular settlement communities with long tenure histories.

The mapping of precarious settlements was updated in 2014 in order to assess socio economic vulnerabilities and physical challenges, such as sanitary sewage, water supply, drainage, accessibility, pavement index and illumination, in a more precise fashion. "Communities of Social Interest" (CIS) were identified within Recife, which account for roughly 20 per cent of the entire municipal territory and 53 per cent of its population. Within those can be found the pre-existent 74 Zones of Special Social Interest (ZEIS), recognised as specific action areas for the city plans and strategies, with the goal of protecting inhabitants of informal areas from the real estate speculation.¹¹

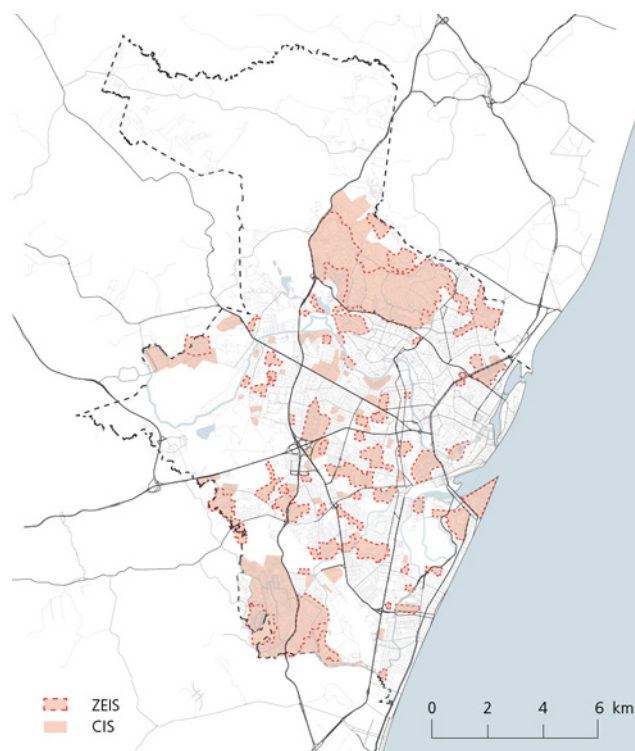


Fig. 6. Social Interest Communities (CIS) and Special Zones of Social Interest. (ZEIS)

The issues of CIS and ZEIS occupies a relevant position in the elaboration of the new Master Plan for the city. Questions of environmental vulnerability, access to basic service, jobs should be addressed and matched with an adequate investment in infrastructure, housing and social facilities.

MOBILITY SYSTEM

Road Network

The road system is based on a radial network extending from the old centre (Barrio do Recife) to the wider city, intersecting perimetral routes. The municipal routes serve both the structural network, receiving traffic from the regional and metropolitan area, and the inner urban mobility.

Federal and state roads are mainly for the national, regional and micro-regional accessibility to Recife and its metropolitan area, reinforcing locational advantages such as important logistical, wholesale trade, services and tourism poles of the Northeast Region of Brazil.

Public Transport System

The Public Transport System of Passengers of the Metropolitan Region of Recife (STPP/RMR) is managed by the Transport Consortium of the Metropolitan Region of Recife (CTM), also called the Greater Recife

Transport Consortium. The operation of the STPP/RMR transportation service is carried out by a combination of 13 private companies and a public company, the Brazilian Company of Urban Trains (CBTU). The system is divided into two: the Integrated Structural System (SEI); and Complementary System.

The SEI is composed by Bus, Bus Rapid Transit (BRT), metro and Light Rail (LRT), all under the same ticketing system. The urban structure of Recife allowed for the conception of a network composed by six radial corridors; two on rails, converging in the centre of Recife, and four perimetral ones, connecting the RMR in the north-south direction without passing through the centre. Feeders and minor line converge at the Intersections of the structural corridors and this way, the system only requires one tariff system.

The SEI cover approximately only 45 per cent of the metropolitan region. The remaining part is served by the complementary bus service, which is not integrated in the SEI and with its autonomous ticketing system.

CHALLENGES AND STRATEGIES

Recife has experienced a huge increase in private vehicle ownership, which almost doubled the number of vehicles in the past decade. This, coupled with the huge traffic from the other municipalities of the RMR, causes high level of congestion. Recife was ranked as the 8th worst traffic congestion in the world (2nd worst in Brazil).¹² It is estimated that 43 per cent of extra time is spent on congestion in Recife.¹³

The road system of the city extends for 2,400 km, but only 650 km are used by buses and only 32.5 km have some kind of priority for buses. Recife has two metro lines, transporting 200,000 passengers per day, while the bus system transports 2.2 million per day. However, this amount is decreasing, due mainly to inefficiencies of the service and the cost.¹⁴ The entire system is put under increasing pressure by the growing traffic and the high level of lateral occupation for the streets, with the high cost of land, hampers the possibility of augmenting the capacity of the roads to adequately accommodate public and non-motorised transport.

Furthermore, the hydrography of the territory and the consequent high number of bridges and the inefficient public drainage system make the network vulnerable to extreme climate events such as flooding and raise maintenance cost. The plans to counterbalance these trends are focusing on the expansion of the public transport offer. A BRT-based solution was introduced in 2014 as part of the World Cup urban interventions, but its performance is still below the projected, lacking network completion and integration with the metro.¹⁵ At the same time, the Mobility Plan under study is evaluating the possibility of expanding the rail network (metro or VLT).¹⁶

There is the possibility of taking advantage of the extensive water network in the city for the implementation of an integrated passenger transport system over the Capibaribe and Beberibe rivers. This could be connected with the renaturalisation projects for the waterbodies of the city to fully exploit their potential as a public space and urban infrastructure.



Fig. 7. Recife Areal View (Source: Wikiwand)

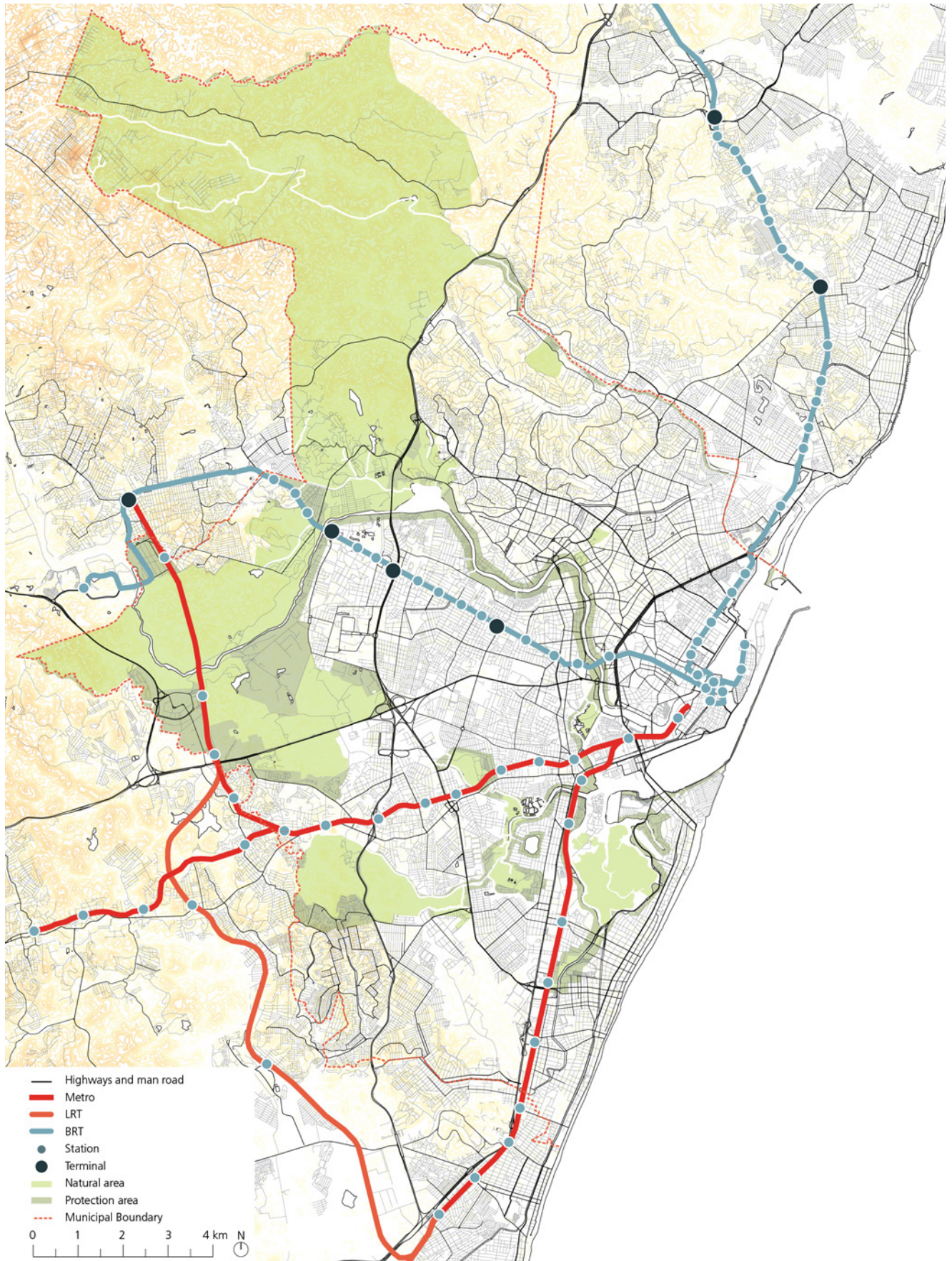


Fig. 8. Main transport corridor and Natural areas

ENVIRONMENT AND RESILIENCE

Natural Assets

Due to the increasing population density in much of the urbanized area, there is a need for planning and implementation of environmentally-viable forms of occupation of new spaces in the urban perimeter.

The current Master Plan¹⁷ contemplates specific protected units in its zoning but according to the legal description, the macrozone of the natural environment and the environmental zones encompass the protected units. This macro zoning defined by the Master Plan of the City divides the municipal territory into two macro areas: the constructed environment and the natural environment. In this, the Capibaribe, the Beberibe and the Tejiú rivers, together with a network of other minor channels, streams and ponds and water bodies have a structuring function. The recognition of this macro area beyond the necessity of mere environmental protection is the base for the construction of a blue-green network as the structuring element of the city.

The Capibaribe Park Project is the main example of this approach. The proposal evolved from the simple requalification of the river banks to the expansion of the area of influence of the Park, and a proposal for a part of the future transformation of Recife into a 'Park City', included in the long-term vision for the city.¹⁸

The renaturalisation of areas of environmental sensitivity is meant to be one of the strategic actions of the future plans of the city. However, it demands definitions and studies about the social cost, concerning the relocation of people occupying the banks of rivers and streams and the elaboration of urban policies and plans that seek a balance between environmental and social aspects.

Water Management

Water security in Recife is guaranteed by intensive use of the aquifers which exist along the coast, mainly the Beberibe one. More than 2000 boreholes are present for the utilization of the water table. However, excessive exploitation can cause environmental problems, such as salinization and contamination. This is becoming more alarming with the increase in private wells and boreholes that became a supplementary source of water supply in the city. It is estimated there are 13,000 private wells in Recife. This could become an increasingly important issue for the city, making Recife vulnerable to resource constraints and drought shocks.¹⁹

This is further aggravated by the poor water management. System loss, both for non-authorized uses and operational losses, were calculated to amount

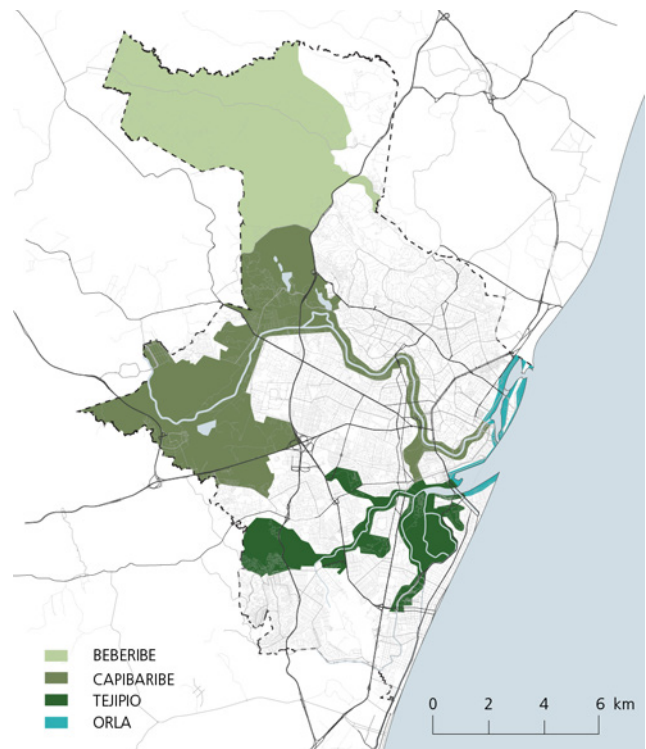


Fig. 9. ZAN - Natural Environmental Areas

to the 64.3 per cent of the distributed water.²⁰ As a result, while 86.7 per cent of households have access to the water network,²¹ many areas connected to the grid, especially among the poorer ones, have a deep deficit in water provision and a discontinuous access to water.²²

Drainage

Recife's low altitude in relation to the sea level, the flat areas, the shallow water table emerging in rainy seasons and the influence of the tide levels are all natural features that make flood management and drainage challenging.

The drainage system is also hampered by the canalisation of the municipal rivers and streams and the encroachment of its banks by regular and irregular constructions, low level of soil permeability and inadequate solid waste management and sanitation. The introduction of irregular sanitary discharges also put pressure on the capacity of the system.

The renaturalisation of water bodies is meant to improve the situation, increasing resilience towards climate change and rising sea levels.

Costal Erosion and Sea Rise

The Pernambuco coast is constantly adjusting to a combination of factors, both natural and anthropic, such as changes in sea level, storms, reduction of sediment supply to beaches (dams and silting in rivers

and retention of sediments in other parts of the Coast), as well as the occupation and waterproofing of the frontal dunes and the beach, preventing the coastline from retreating and remobilising the sediment stock.

The Coastal Erosion and Climatic Changes Vulnerability Atlas in Pernambuco²³ evaluated the current vulnerability as high in the stretches of Boa Viagem Beach (5 km) and in Brasília Teimosa (1,340 m), where the coastline undergoes erosive processes and is stabilised by means of rocking to contain the sea.

AVAILABLE OPEN DATA

In the city, large cohorts of geographical, semi-geographical (with and explicit or implicit association with a location) and non-geographical data are present but not all of them are available to the public.

For example, the Municipality has published a wide range of Atlases, including spatial information and analysis, but raw data are often accessible only with a lengthy bureaucratic procedure. Even between different levels of the administration and different departments data sharing is a challenge. At the same time, much of information that non-public entities collect fails to find an appropriate space to be published. When available, standards and guidelines are not established.

Nonetheless, the Municipality has made a significant and positive move on publishing data and promoting it.

Portal da Transparência

(Transparency Portal – <http://transparencia.recife.pe.gov.br/>): conceived by Emprel (IT Municipal Company) in 2013, provides data from 15 secretariats and 15 public companies and councils, involving general and detailed expenses, revenues, bids and contracts, civil servants salaries, financial statements, budgeting, detailed data on health, education and security (newsletters, municipal plans, projects and actions).

Portal da Dados Abertos

(Open Data Portal – <http://dados.recife.pe.gov.br/>): conceived by Emprel with the collaboration of CIn-UFPE in 2013 as a complementary initiative to the Transparency Portal, It is a free-access website where 65 open datasets from 17 public entities can be previewed and downloaded for free use in proper interoperability-driven formats, covering different themes:

Transit and Mobility: 14 data sources, including geographical (bus lanes, bicycle paths, rental bike stations and semaphores), semi-geo (accidents yearly) and non-geographical data (vehicle stream, calls, speed

record and traffic violations on a yearly basis)

Health: 11 data sources, geographical (sanitary districts, public gyms and health units), semi-geographical (zika/dengue/chikungunya cases and ambulance removals yearly) and non-geographical (vaccination calendar)

Education: 9 data sources, geographical (schools) and non-geographical (scholar census yearly and student situation)

Infrastructure: 5 data sources, including geographical (public equipment, squares and parks and administrative divisions) and non-geographical (sidewalks cadastre)

Finance: 4 data sources, semi-geographical (companies' description and public buildings' description) and non-geographical (revenue and expenses)

Maintenance: 4 data sources, geographical (cemeteries), semi-geographical (garbage collection roadmap) and non-geo (call for maintenance and waste weighting)

Tourism: 3 data sources, geo (touristic routes and hotels) and semi-geo (bars and restaurants)

Environment and employment: 3 data sources, geo (protected trees, selective collections and employment support posts)

Technology: 3 data sources, geographical (public Wi-Fi hotspots) and non-geographical (data demand and open data mapping)

Civil defence: 2 data sources, geographical (landsliding and flood risk areas) and non-geographical (info on risk areas demand)

Informações Geográficas do Recife – ESIG

(Geographic Information System for Recife – <http://www.recife.pe.gov.br/ESIG/>): conceived in 2010 by the Geoprocessing Group of the Municipality as a free-access webGIS resource platform of local data. It provides six territorial geodatabases (lots, streets, blocks, block faces, districts and referential grid) in multiple formats. The urban zoning is not available for download. ESIG's platform is not integrated to the Open Data Portal nor the Transparency Portal.

Possible Data to be Available

Census data, as well as accurate land use shapefiles, building footprints and property data, environmental performances, traffic studies and so on are all produced by the administration. Many of the plans under elaboration (strategic, master and mobility) have updated data which could be open to the public. The same applies for live data such as traffic, garbage truck roadmaps and CO₂ emissions.

Possible data from private sources cover many different app and services currently active in the city, featuring many aspects of daily life, from transport (such as Waze) to domestic violence and sexual harassment zones geo data such as Nina, Mete a Colher.

Financial Context

MUNICIPAL CAPACITY

Recife does relatively well among other Brazilian municipalities in raising local taxes, however, there is room for improvement. Recife had a total budget in 2017 of approximately 4 billion Brazilian Real (about USD 1 billion). This translates into approximately USD 666 per capita, which contrasts with the budget of Belo Horizonte that is about USD 1000 per capita.²⁴

Comparing to other municipalities in Brazil, Recife has higher own source revenues. While on average, local taxes represent only 6% of revenues in the municipalities of Brazil,²⁵ own source revenues in Recife constitute 35%. Still, the majority of Recife's budget comes from intergovernmental transfers (45%),²⁶ which points to a dependency on the central government for capital expenditure.

Over time, Recife has become more dependent on 'Tax on Services'²⁷ which is a tax levied on goods and services rather than income or profit. While the Urban Land and Property Tax remains an important source of revenue, evidence suggests that these taxes are under-utilised in favour of the Tax on Services and intergovernmental transfers.²⁸

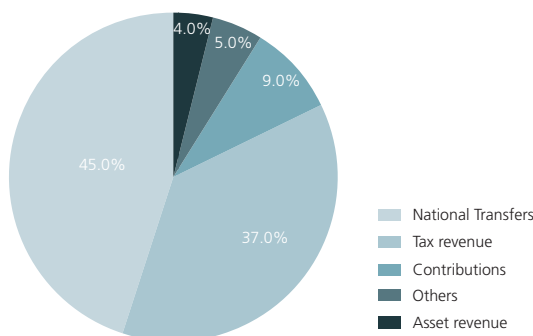


Fig. 10. Recife Total Revenue (2017)

In terms of expenditures, it is worth noting that urban planning accounted in 2017 for only 9.9% of the expenditures. This is significantly lower as in other cities, which should be considered within the financial context of the city as it is most probably the direct source of funding at municipal level that aligns with the intervention.

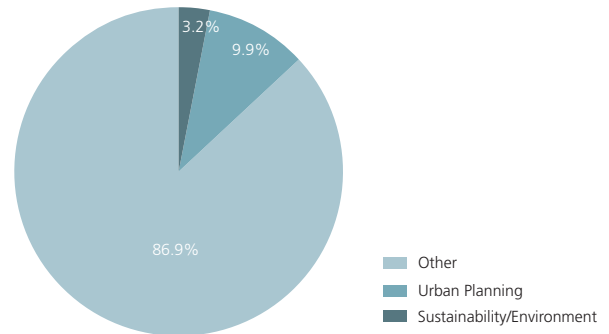


Fig. 11. Recife Spending Outlay

MUNICIPAL FINANCING MECHANISMS

Recife has the precedent to borrow internationally. It has received a loan from World Bank for \$32million for urban development in 2007 after several years of negotiations. However, municipalities in Brazil face several restrictions in terms of national and international borrowing following the adoption of the Fiscal Responsibility Law (Lei de Responsabilidade Fiscal e Finanças Publicas Municipais) in 2000, which imposed restriction on debt and spending.

On the PPP front, while Recife has not entered PPP, the state in which Recife is located in, Pernambuco, has broader PPP agreements which covers Recife. In 2013, for example, COMPESA, which provides water and sanitation in the state, delegated parts of its duties to private sector providers under a PPP agreement. However, in Brazil the enabling regulatory framework for PPPs is in place.

Under Federal Law (8666/93), there are detailed and uniform procedures for procurement that should be adhered to by all layers of government, including the municipal entities. In most municipalities, there are internal control entities which are nominated by the municipalities themselves to oversee the public procurement procedure.

Urban Governance Data Environment

The setting up and maintenance of the Urban Knowledge Hub (HUB) will require investment and continuous revenue streams by the city. However, while data strategies can have significant effects on the economy by increasing revenues for the city, these are difficult to measure.

In turn, there is an opportunity to work with the private sector. They will have an interest in the data itself as well as its analysis, utilisation and, ultimately generating revenue through its potential monetisation. However, in this case the city should carefully address the costs associated with engaging the private sector, taking into account the possible risks of jeopardising the project in their interest or the lack of sustainable strategies in the long run.

It is important to note that because the HUB is meant to provide for open data, the scope for monetisation will be extremely limited. In this case, user fees, such as fees for access to the data, cannot be charged because it will go against the principles of open data. However, there is space for monetisation mechanisms based on delivery of data services and processing, since the open data principles are respected.

Finally, there is the possibility of receiving national funding for the intervention or grants from international financial institutions, such as the World Bank or the Inter-American Development Bank. In this regard, the existing restrictions on national and international borrowing on Brazilian municipalities should be considered.

Legal Context

GOVERNANCE STRUCTURE

Recife experiences today an environment of synergy between companies, government and research institutions in the sector of ICT and data use in planning. One of the main well-succeeded local cases is the local technological cluster Porto Digital, that holds about 300 ICT and creative economy driven companies and holds about 9000 jobs. All these companies are benefited by local and state incentives (mostly tax reductions). However, regarding to urban development based on ICT and data, there is still a lack of a broader collaborative agenda.

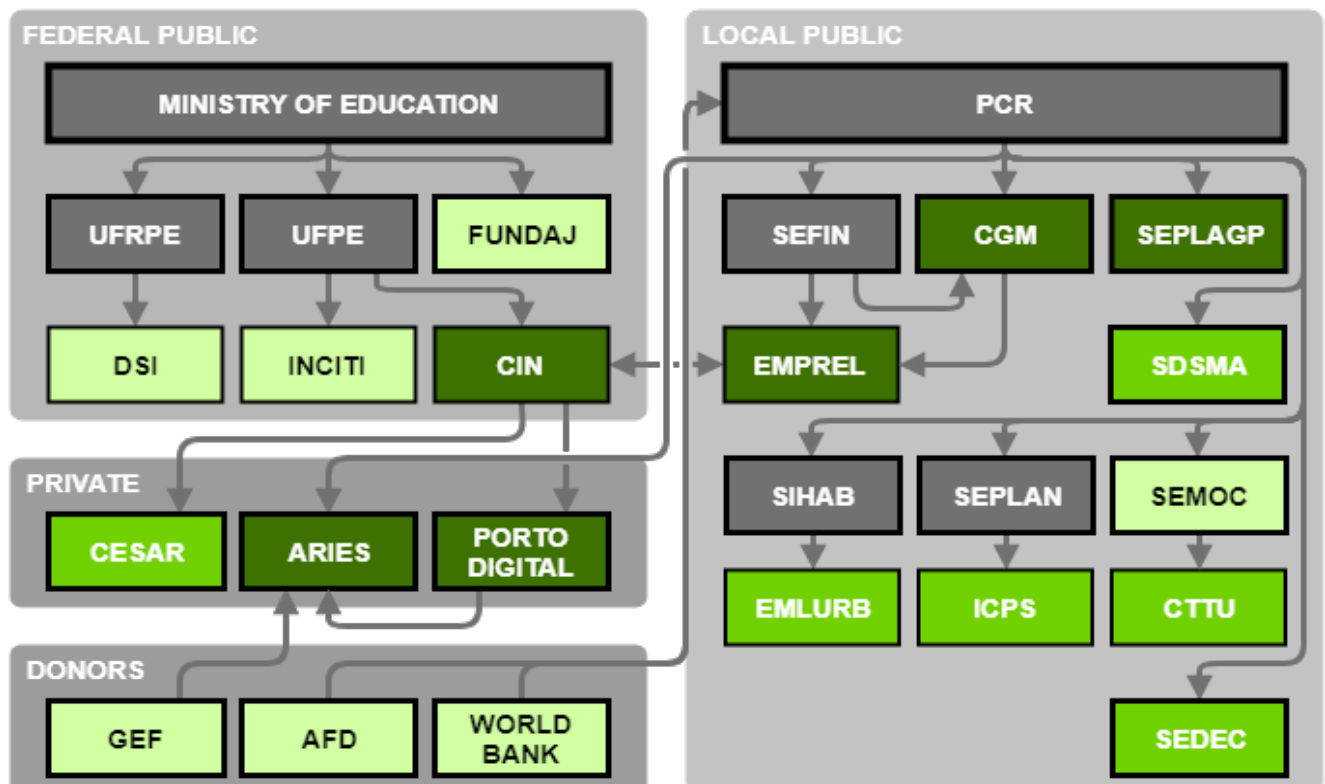


Fig. 12. Federal and Municipal Governance Structure

The proposed Global Future Cities Programme intervention would attempt to align local governance stakeholders in the structure for knowledge management outlined in Fig 12 below.

The public sector is represented by the Universities and the Recife Municipality (PCR) level government departments: SADGP (responsible for engaging all other secretariats on strategical projects and results delivery), CGM (responsible for ensuring control on public spending, transparency and fighting against corruption) and EMPREL (responsible for creating and maintaining information systems). ARIES, a private and non-profit entity that is responsible for conducting the long-term plan Recife 500 Years, is also a key stakeholder.

ALIGNMENT TO EXISTING PLANS AND POLICIES

Technology (ICT, tech hubs and innovation) is one of the key drivers of policy making in Recife. Recife has a plan called Recife 500 Years, which establishes a set of policies to be fulfilled by 2037, the 500-year anniversary of the city. One of them is to create a 100 per cent-connected city. Recife has a set of initiatives to achieve this goal, including public policies on open data.

The Municipality of Recife (PCR) has been engaged in the process to build and review the Municipal Directory Plan and the Urban Mobility Plan. PCR is also participating in the elaboration of the Metropolitan Integrated Development Plan and Metropolitan Mobility Plan. The Municipality has plans for emission reduction and waste management, following the national regulations.

LEGAL FRAMEWORKS FOR DATA USE IN URBAN PLANNING

It is critical for ambitious policies to be backed by adequate legal frameworks to guide their implementation. Therefore, the following analysis of legal frameworks for using data in urban planning is relevant to consider in implementation.

Open Data

Brazil's 2011 Information Law mandated Recife to publish public interest data such as that on municipal finances, health, education and tourism. Recife discloses this data through individual requests and also through an active 'transparency portal' which allows for a public access to various datasets the government has.

Data Privacy

On August 14, 2018, Brazil approved the General Data Protection Law to establish a unified legal framework for data usage across the country. The law has 'transversal, multi-sectoral application to all sectors of the economy.'²⁹

Data Collection, Standardization and Integration

Overall, there is limited standardisation and integration of data collected by multiple municipal departments. For example, land-use data falls under the Information Office of the Secretariat of Mobility and Urban Control, while transport data is collected and managed by CTTU. Although the Municipal Information Technology Company of Recife (EMPREL) does integrate significant amounts of data for the transparency portal, it neither owns the data, nor is it the principal objective of EMPREL, hence there are reports of lack of capacity to deal with such collection.

EMPREL integrates data by identifying the relevant data in priority areas such as health, education and finance. EMPREL extracts the data collected by other institutions, then standardises it either in a csv or geojson format.³⁰ This data is then published on the portal. Despite the general lack of standardisation, a notable exception is the GIS data where there is considerable integration of GIS database and urban licensing mechanism, which allows the database to be updated with the new building information when the licence is issued.

INTERNATIONAL ALIGNMENT AND TECHNICAL RECOMMENDATIONS

Potential Impact

The potential impact analysis outlines the main benefits that can be potentially attained through the Global Future Cities Programme in Recife, under the assumption of short-, medium- and long-term work. Nevertheless, as impact can arise from a complex interaction of context-specific factors, rather than as result of a single action, an empiric impact assessment is out of the scope of this report.

The short-term work refers to the outcomes that can be achieved through the implementation of the technical assistance support within the 2-3 year scope of the Global Future Cities Programme. Mid-term outcomes are only achievable once the intervention is executed at the city level either through capital investments or the legal validation of key polices and plans. Long-term impact of the interventions is linked to the sustainability of the interventions in a 7-15 year timeframe and is related to the project cycle phase of operation and maintenance.

SHORT-TERM OUTCOME

In the short term, the 2-3 years of the Global Future Cities Programme's implementation in Recife will positively impact the municipal technical and managerial capacity whilst increase citizens' inclusion in plans development and decision-making processes.

The intervention has the potential to provide to citizens, both from the public and the private sphere, the instruments (Urban Knowledge Hub) and the capacity (Data Engagement Action Plan) to access, visualise, asses and share the information related to urban governance. On one side the transparency and accountability of the municipality will increase (Data Governance Framework), on the other the direct and indirect contribution of several society groups will be promoted.

Moreover, through the Data Science Platform (included in the Data Governance Framework), the Municipality has the potential to identify and develop specific data-based innovative projects to address urgent urban issues. This possibility can lead to a monitor and assessment process of the intervention in all its components so to evaluate the achieved results after a short timeframe.

Better data availability (Urban Knowledge Hub) and analysis capacity will bring in the increased efficiency in prioritizing strategies and tools for decision-making, since a new data-based participatory tool will be available. The improved accessibility to statistics on demographic, economic, environmental and social issue will in fact allow an evidence-based decision process. The intervention (Data Engagement Action Plan) promotes also a strong attention to the collection of data related to the most vulnerable society groups as women and low-income communities, also through the direct contribution of NGOs or communities' associations and communitarian inclusion.

Finally, the integration of these different data will also promote a better coordination and cooperation between different municipal departments and levels of government that will have the possibilities to more easily analyse and compare data, plans and strategies of different departments, as well as enable the private sector to be more effectively engaged and participant, thanks to the availability of more and better data.

MID-TERM OUTCOME

In the mid-term the intervention will strengthen the data governance of the city (Data Governance Framework), enabling the capacity to produce, process and cross data from different sources, both from

public and private contribution. These will lead to a progressive improvement of the land management and administration system towards a more sustainable and resilient urban development.

Through the Data Engagement Action Plan, the public engagement and capacity building processes in data-related topics, together with a regulated and legal and managerial framework, will increase the creation of job opportunities and the possibility to access professional occupations related to the emergent ICT fields. This potential impact will benefit mainly groups that currently have limited access to education or professional and vocational training such as low-income communities, the youth and women.

LONG-TERM POTENTIAL IMPACT

The long-term impact of the intervention concerns a broad range of urban and social issues and represents the frame where the development of the Data Governance Framework, combined with the Urban Knowledge Hub and the Data Engagement Plan, expresses its potential.

The increased evidence-based awareness and the improved administrative control of urban, social and environmental data will allow for a more efficient and sustainable financial urban management. The intervention has the potential to improve the city's capacity to optimise and reduce public expenses and to strengthen municipal finances and increased municipal capacity for revenue.

The possibility of accessing and comparing data regarding related to urban, transport and natural environment can lead to monitoring the current city plans and to improving their quality for the future city strategy. The land use of the city can be optimised towards a mixed use and efficient urban expansion, where the provision and distribution of basic services is based on a clear knowledge of the urban inequalities.

The city will have improved tools to provide more secure, safe, and accessible public transport, particularly for women and the elderly, and a more diffused mobility service for low-income groups and peri-urban areas. The better management of the transport system can then reduce the traffic congestion and reduce air pollution.

The intervention has the potential to lead towards better planning and increased monitoring and capacity for forecasting environmental risks. In the city of Recife these components have a key role in the reduction of pollution levels and greenhouse gas emissions and also in the management of growing threats related to climate change such as flood and coastal erosion.

The intervention in this sense aims to enhance and promote professional and cultural data-related environment toward a sustainable urban and social development of Recife.

Contribution to Sustainable Urban Development

2030 SUSTAINABLE DEVELOPMENT GOALS

The Global Future Cities Programme aims to contribute the implementation of the 2030 Agenda for Sustainable Development, whilst mobilising efforts to end all forms of poverty, fight inequalities and tackle climate change and ensuring that no one is left behind.

INCLUSIVE AND SUSTAINABLE URBANIZATION



The Urban Governance Data-Ecosystem will enhance inclusive and sustainable urbanization through a responsive, inclusive, participatory and representative decision making at all levels (SDG 16.7). The participatory process and the community involvement in several sectors of public life will allow a stronger monitoring and evaluation process on the public administration, leading to the establishment of more accountable and transparent institutions at all levels (SDG 16.6).

STRENGTHENED CITY POLICIES



Moreover, the Data Governance Framework and the Urban Knowledge Hub will “increase significantly the availability of high-quality, timely and reliable data disaggregated by income, gender, age, race, ethnicity, migratory status, disability, geographic location and other characteristics relevant in national contexts” (SDG 17.8). This data use will lead to an improvement and strength city policies to “enforceable legislation for the promotion of gender equality and the empowerment of all women and girls at all levels” (SDG 5.c).

ENHANCED ACCESS TO INFORMATION



The Data Engagement Action Plan can also significantly increase access to information and communications technology (SGG 9.c) and “promote development-oriented policies that support productive activities, of ICT related job creation, entrepreneurship, creativity and innovation and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services”(SDG 8.3).

IMPROVED ACCESS TO PUBLIC TRANSPORT



In the long-term future an evidence-based urban governance can improve the condition of such public services as transport system (SDG 11.2) and public spaces (SDG 11.7), making them more accessible, safe and affordable for all, with special attention to the needs of those in vulnerable situations and women, children and persons with disabilities.

INCREASED RESILIENCE



Finally, the intervention’s objectives are also aligned to the goal of promoting a more environmentally-sustainable urban development and develop the integration of climate change measures into national policies, strategies and planning (SDG 13.2). The Urban Governance Data Ecosystem implementation would allow better monitoring, report and forecast processes of climate events that need to be faced with an effective climate change-related planning and management (13.b).

NEW URBAN AGENDA ALIGNMENT

At the United Nations Conference on Housing and Sustainable Urban Development (Habitat III) in Quito, Ecuador 2016, the New Urban Agenda (NUA) was adopted. This Agenda details how cities should be planned and managed to achieve sustainable urbanization.

The New Urban Agenda encourages UN-Habitat, Member states, local authorities, and others to collaboratively generate evidence-based and practical guidance for implementing the urban dimension of the SDGs.

UN-Habitat's draft Action Framework for Implementation of the New Urban Agenda (AFINUA) is organized under five categories:

- national urban policies
- urban legislation, rules and regulations
- urban planning and design
- urban economy and municipal finance
- local implementation

The Programme's intervention/s align to the AFINUA in the following ways:

The intervention in Recife will lead to set up under a planning and design process that is evidence-based and participatory (AFINUA key item 3.1) and will contribute to establishing and supporting community-led groups that bridge the citizens and government (AFINUA key item 5.6).

The intervention will help to the design and the implement systems that ensure social, economic and safe physical access to quality basic services by all (AFINUA key item 4.5). This should go along with the provision of integrated, efficient and equitable urban service frameworks, particularly in unplanned, built urban areas (AFINUA key item 5.4).

Coordination and cooperation between different institutions and levels of government during the Global Future Cities Programme in Recife will promote two AFINUA key items: the alignment between national and sectoral development plans and policies at all territorial levels (AFINUA key item 1.4) and jurisdictional coordination and coherence (AFINUA key item 1.6).

Moreover, with the improved involvement of the citizens, along with a comprehensive access to the municipality data, the intervention can support local authorities to design and implement a more inclusive, sustainable and equitable local financial and economic framework to operationalise municipal finance principles (AFINUA key item 4.2). At the same time, the capacity-building and engagement programmes related to the

ICT environment can support the implementation and design of tools for fostering inclusive local economic development such as job creation, entrepreneurship and microfinance (AFINUA key item 4.4).

ALIGNMENT WITH CROSS-CUTTING ISSUES AND THE PROSPERITY FUND

The Global Future Cities Programme seeks to achieve higher rates of sustainable and inclusive growth while increasing long-term investments in sustainable urban projects. Moreover, it will provide greater awareness, capability and confidence while establishing regulatory frameworks resulting in higher incentives for partnerships and financial mechanisms.

The four Cross-Cutting Issues of UN-Habitat, as identified in the Strategic Plan 2014-2019, are mainstreamed to ensure that all UN-Habitat work targets those with the most need and promotes socially- and environmentally-sustainable cities.³¹ In this regard, the interventions detailed for Recife are shaped under the mainstreaming of environmental safeguards for youth, gender equality and human rights.

The implementation of the Urban Governance Data Ecosystem in Recife is strongly aligned with the Programme's objective; it focuses on the engagement of all society groups, with a particular attention to the most vulnerable who are defined as the youth, women and low-income communities.

These are groups that nowadays have the most limited access to information, are less involved in the public decision-making process and are in most need of education and professional and vocational training. The intervention aims to provide these services and enlarge the range of the beneficiaries and to involve them in a process of cultural and professional engagement in the growing ICT environment and smart economy.

The generation and publication of disaggregated data focused on gender-sensitive issues and demographic and economic trends represents key steps to enabling and encouraging the municipality in developing policies, programmes and plans aligned with the necessities of the most vulnerable in society. These processes can lead to the development of a safe and lively urban environment while promoting a proactive participation of these groups to the public life thanks to the improved access to information and to interactive and open communication tools such as virtual communities.

Furthermore, the intervention promotes the participation of all society levels through a more organised and comprehensive collection of environmental data and in the access and comparison of current and future plans related to climate change and environmental issues.

A stronger involvement of the public authorities together with local communities has the potential to enable a more effective process of monitoring and reporting environmental and climate change dynamics and to provide the Municipality with innovative and inclusive tools to forecast risks and to propose strategies and solutions to guarantee environmentally-sustainable urban development.

The following statements are considered as evidenced success factors, based on international best practices, for the interventions in Recife to achieve maximum impact in line with the Goals, the Prosperity Fund and the cross-cutting issues. Success factors are divided into spatial, financial and legal and aim to address potential barriers to the long-term sustainability of the interventions.



Fig. 13. Recife's Urban Fabric (Source: Gustavo Pentead, Flickr)

Potential Benefit	Short term	Medium Term	Long term	SDG Alignment		New Urban Agenda	Programme Objectives and Cross-cutting issues
				GOALS	TARGETS	AFINUA KEY ITEM	1. Climate change; 2. Gender equality; 3. Human Rights; 4. Youth; 5. Sustainable and inclusive economic growth
Increased citizen participation in assessing and developing municipal plans and decision making processes.				11, 16	11.3; 16.7	3.1, 4.5, 5.6	Gender equality; Human Rights; Youth
Increased local capacity for evaluating and monitoring the impact of urban plans, policies, and strategies.				17	17.16; 17.18	3.1, 5.1	Climate change; Gender equality; Human Rights; Youth
Increased capacity to prioritize strategies and improved tools for decision making based on informed demographic, economic, cultural, environmental and other holistic projections.				11, 17	11.a; 17.18	1.1, 3.1	Climate change; Gender equality; Human Rights; Youth; Sustainable and inclusive economic growth
Better Governance & Integrated Management of cities including better coordination and cooperation between different levels of government.				17	17.14; 17.15	1.4, 1.6, 2.5, 5.5	Climate change; Human Rights; Sustainable and inclusive economic growth
Improved last mile connectivity and increased access to information and communications technology.				9	9.c	3.1, 4.4	Gender equality
Integrated gender equality approach in policies, strategies and plans.				5	5.c	3.1, 4.4	Gender equality
Integrated plans, frameworks and approaches to promote more sustainable, resilient, and socially inclusive cities				1, 11, 13, 16	1.5; 11.3; 13.2; 16.7	1.1, 1.5	Gender equality; Human Rights; Youth
Increased creation of job opportunities, particularly for women, youth, and disadvantaged groups.				1, 8	1.2; 8.3; 8.5; 8.6	3.4, 3.8, 4.4, 4.5	Gender equality; Human Rights; Youth; Sustainable and inclusive economic growth
Increased ability to better plan inclusive economic growth in a sustainable, climate smart manner.				16, 17	16.6, 17.1	2.5, 3.8, 4.1, 4.2, 4.4, 4.5	Climate change; Human Rights; Youth; Sustainable and inclusive economic growth
Established land management systems, including fit for purpose planning tools and land administration, for the sustainable delivery of all other elements of the urban fabric.				11	11.a; 11.3	4.2, 4.5, 5.2, 5.3	Climate change; Gender equality; Human Rights; Youth; Sustainable and inclusive economic growth
Implemented urban plans for creating sustainable density and mixed use to attain the economies of agglomeration and promote urban vibrancy.				11	11.1; 11.2; 11.3; 11.7	2.2, 3.3, 3.4, 3.5, 3.8, 5.1	Gender equality; Youth; Sustainable and inclusive economic growth
Increased efficiency, quality, and reliability of public infrastructure and basic services.				9, 12	9.1; 12.2	4.2, 4.5, 5.3, 5.4	Climate change; Human Rights; Sustainable and inclusive economic growth
Strengthened municipal finances and increased municipal capacity for revenue generation.				17	17.1	2.6, 3.4, 4.1, 4.3	Sustainable and inclusive economic growth
Higher rates of sustainable and inclusive economic growth, greater investments flows & greater trade flows				9, 17	9.a; 17.3; 17.9	4.1, 4.2, 4.3, 4.4, 4.5	Sustainable and inclusive economic growth
Increased mobility and accessibility for poor women and men and other marginalised groups.				9, 11	9.1; 11.2	3.3, 5.3, 5.4	Gender equality; Human Rights; Youth
More secure, safe, and accessible public transport, particularly for women and elder				11	11.7	3.3, 5.4	Gender equality; Human Rights; Youth
Reduction in traffic congestion and in air pollutant emissions				13	13.2	3.3, 3.5, 5.3	Climate change
Better Planning for & Managing the impacts of climate change				11, 13	11.b; 13.2	2.1, 2.2, 2.3, 3.2	Climate change
Enhanced monitoring of environmental risks and increased capability for forecasting				13	13.2	3.6	Climate change

Fig. 14. Potential Impact and Programme Objectives Alignment

Success Factors

BUILDING AND MANAGING DATA SYSTEM FOR URBAN PLANNING

Establish Planning Needs and Identify the Associated Data Requirements

A clear definition of planning problems and objectives will facilitate the scoping of an intervention and inform future data collection efforts. It will identify the datasets that correspond to the planning activities and objectives. Datasets that are relevant for planning may include land use,³² disaggregated on population characteristics, cadastral and physical geography.

Engage in Efficient Data Collection Procedures

Data collection can be shaped by planning objectives. To avoid duplicating datasets and wasting data collection resources, it is crucial to search for existing relevant datasets that may have been gathered by other organisations and explore partnerships with other institutions. Urban data centres in the Netherlands, for example, are supported through a partnership with the national statistics institution (CBS) to gain access to a wide range of existing datasets.³³

Consider Balancing Authoritative Datasets With Information That Reflects Local Perspectives

A focus solely on authoritative, government-generated data, such as that from Census surveys, may result in a top-down approach that disregards local perspectives. Information generated by citizens, or in direct consultation with citizens, should also be included in the planning process.

While traditional methods of public consultation continue to play an important role in planning processes, planners are looking to incorporate newer types of public engagement, which are made possible through data systems and technology. For example, volunteered

geographic information (VGI) and other crowdsourced data can be a valuable source of planning information that is sensitive to the local context³⁴ and inexpensive to collect.

However, it may be difficult to assess the quality and accuracy of crowdsourced information as the identity, expertise and motivation of a contributor often remains unknown. Platforms that incorporate VGI, such as OpenStreetMap,³⁵ may in part rely on the assumption that inaccurate data will be flagged or corrected when there is a large enough crowd engaged in contributing content. The PetaBencana.id example³⁶ exemplifies how crowdsourced data can be used to monitor flood conditions in real time.

Data Quality Assessment and Data Standards

Data quality assessment is an integral component of a data system. Policies and approaches should be developed to address issues such as completeness, uncertainty, and measurement error. The Municipality Data Governance Framework (DGF) component of the intervention will include a detailed set of recommendations for conducting data quality assessments.

Datasets will have to be updated when necessary to ensure relevance and accuracy. The inclusion of metadata is also critical in informing conclusions regarding the quality of a dataset. Relevant metadata includes information such as data sources, date of data collection and data collection methodology.

At the same time, the municipality of Recife will have to appoint a data custodian responsible for managing datasets throughout all phases of the data lifecycle. This includes activities such as creating, maintaining, and enforcing data standards and ensuring the availability and quality of datasets. Best practices in data management should be formalised as well under the DGF. Such policies and guidelines may include topics such as data security procedures, data access and appropriate disposal of data.

Policies, Protocols and Data Standards for Data Sharing

The UGDE will likely involve coordination and data sharing between a variety of government departments. It is important that policies and protocols for data sharing are in place, which must comply with relevant data protection and privacy laws. Such policies can, for example, cover privacy and security considerations, and outline clear responsibilities for data ownership. The development of protocols and policies for data sharing can also be an opportunity to adopt data standards and create protocols for data quality monitoring.

The Municipality Data Governance Framework component of the intervention is directed at this aim.

The adoption of data standards can also promote the interoperability of datasets, allowing for data from a variety of sources to be combined and compared. The adoption of standards can also facilitate data sharing between departments and institutions. Types of data standards may include those that govern metadata, specification of character formats, predefined vocabularies, and file formats (Sieber and Bloom, 2018). Standardised data can also be used by software developers to create apps.

For example, the adoption of GTFS (general transit feed specification) by many transit operators around the world has led to the creation of transit apps (such as the Transit App)³⁷ that combine multiple sources of transit schedules around the world. Open 511³⁸ and GTFS³⁹ are examples of existing data standards for road event data and transit data, respectively.

Moreover, the Open Data Standards Directory⁴⁰ provides detailed information on existing data standards for data from categories such as crime, expenses and election results.

Ensure Representativeness in Datasets

Where appropriate, data collection efforts should be evenly distributed across geographic and socioeconomic communities. Communities that are not represented in data may be excluded from policy and planning decisions, potentially exacerbating existing social divides.

The Urban Knowledge Hub component of the intervention partly covers this need, offering a platform for involving the wider possible audience in the sharing and active use of data.

Develop a Strategy for Digital Inclusion

Citizens who lack access to digital services may be excluded from planning processes, and are put at a disadvantage when it comes to accessing the city and its services.

Research on the digital divide indicates that individuals who lack basic digital skills, network connections and usage opportunities may not be able to benefit from city services or information which are delivered through digital platforms such as a municipality's open data portal. For instance, the Smart Cities for All initiative works towards building inclusive smart cities and promotes digital urban interventions that are accessible to elderly and disabled populations.⁴¹

The INSPIRE Directive, for example, enables environmental data sharing throughout the EU by outlining a set of data standards across 34 spatial data themes. This cross-boundary data sharing initiative has assisted in environmental policy-making efforts by making data more accessible. Indonesia's One Map policy also illustrates how the centralised management of geospatial data at a national level can resolve issues such as overlapping land claims.

The Data Engagement Action Plan (DEA) component of the intervention proposed in Recife is meant to cover this fundamental aspect.

APPLYING DATA SYSTEM FOR URBAN PLANNING

Adapt the Data Systems and Their use to the Planning Context

Consider how data can be translated into useful planning information. Analysis techniques may include data layering, visualisation, exploring relationships between datasets, computational models and big data analysis. Information from data analysis may be used to understand the local context, make predictions or projections of future growth, develop spatial strategies and visions and more.

Build and Formalize Practices for Integrating Data Analysis Into Decision-making Processes

Data systems may be applied to measure the impact of previous plans and policies, which can inform the making of an urban plans. It is important in that sense to consider how the information obtained from data analysis will inform and support urban planning decision-making.

At the same time, digital technology creates the opportunity for new approaches to public engagement in urban planning. Online apps and tools can facilitate two-way communication between citizens and municipal government. This could raise awareness on local urban development plans while also making prominent critical issues regarding gender and vulnerable groups, violence and sharing local knowledge among citizens.

Capacity Building

It is important to develop human capacities and quantitative skills within planning professionals to match investments to data technology. This ensures that the information contained in a dataset can be turned into actual benefits for users and operators. While specific capacity needs will vary with each case, a baseline level of digital literacy for urban planning staff is necessary to ensure effective application of data systems.

Capacity-building efforts are included in the DGF as well as in the DEA. Necessary skills may include geospatial analysis, computer programming, statistics and database management. The Rio Operations Centre⁴² is a successful Brazilian example of how partnership with a technology company can build local capacity for embedding a large-scale data system in a city.

FINANCIAL CONSIDERATIONS

Private sector engagement

Besides the investment dedicated for the intervention, operation and maintenance within the project cycle are fundamental phases and will require funds.

Private sector involvement can be a sustainable way to operate the UGDE. Recife is a national leader in ICT and its community, integrated in the Urban Governance Data Ecosystem, could not only profit from the intervention but also provide significant gains:

- Systems and technological solutions could be expanded and kept up to date
- Significant cross-learning could be triggered between private enterprises and start up and the city government

The open nature of the UGDE, supported by the necessary policies, should provide enough guarantees to maintain the services beneficial for all, while not privileging private individual interests. Greater analytical and managerial capacity could be provided, as well as a push towards efficiency.

LEGAL CONSIDERATIONS

Open Data Policies

Open data policies and regulations are essential to ensure that the data is shared and interoperable by different operators and agencies. This is a necessary condition to maximise all the potential gains of the intervention in promoting integrated urban and transport planning.

Additionally, open data policies could allow the use of data by entrepreneurs for new innovative projects, which could enhance small- and medium-sized enterprises. Moreover, open data policies are essential to ensure transparency and allow citizens to monitor the performance of the transport system and hold the city government accountable.

Regarding the private sector, open data policies can avoid the creation of monopolies through which the public sector can only contract the service provider that has access to the information.

Privacy Law

Brazil has recently approved a comprehensive data privacy regulation. This is an essential step for the use of any data-related project as it ensures that the collection of data is not used for purposes of which citizens are not aware. Moreover, the law regulates the balance between opportunities for private companies to profit while maintaining citizens' rights.

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