## Smart city projects from around the world: The ecosystem as organising principle

There are numerous reviews on smart city plans and projects that allow undesstanding what various cities do to implement the smart city model. This is the case of the book *Technology and the city: Systems, applications and implications* authored by Tan Yigitcanlar and published by Routledge (2016). Tan reviewed ten cities in Asia, Europe, Middle East, USA, and Oceania that have implemented smart city strategies and projects, and outlined the diversity of innovations that have been introduced:

- Songdo, Korea is part of the national programme of economic development, focused on broadband networks, sensor-based solutions for smart living, offering a test-bed for RFID, and R&D on smart technologies.
- Tianjin, China, developed a smart city masterplan based on 26 KPIs, and solutions for eco-city ICTs, intelligent building management systems, and sensing technologies.
- Amsterdam, Netherlands, focused on ICTs for a better urban environment and reduction of CO<sub>2</sub> emissions, ICTs for user-engagement, and smart city projects for mobility, living, working, public space, and open data. Dominant is a retrofitting approach implemented through a series of physical-digital projects.
- Barcelona, Spain, has the area 22@Barcelona as a flagship innovation district; Sant Cugat for testing sensor-based parking, traffic jam avoidance, garbage collection, environment monitoring, street lighting; and solutions for smart buildings, smart grid, and smart metering.
- Mazdar, Abu-Dhabi, focused on the creation of a global clean technology cluster, electrified mass transit system, and energy metering systems. Also included is the MIST science and engineering research university developed in collaboration with MIT.
- Istanbul, Turkey, focused on ICTs for transport, the use of dynamic intersection signalling, and traffic data analytics; also, ICTs for earthquake monitoring with real-time alert and gas distribution control in case of earthquake events.
- Rio de Janeiro, Brazil. IBM installed an Intelligent Operations Centre with dozens of control systems for electricity, water, oil, gas, transport, traffic, smart meters for energy saving; a safety and emergency response system for crime prevention and policing using cameras and real-time analytics.
- San Francisco, USA, developed ICT solutions for sustainability, zero waste, recycling, CO<sub>2</sub> reduction; and applications for sustainability such as energy mapping, energy use challenge, honest buildings, open data and living labs for energy optimisation.
- Auckland, New Zealand, focused on ICTs for innovation in the sectors of energy, transport, waste, buildings, food, agriculture; digital learning and skills development, enterprise development, entrepreneurship of innovation-led companies.
- Brisbane, Australia, gave priority to ICTs for growth, knowledge-based development, knowledge precincts, and the Brisbane knowledge corridor; it also developed ICTs for sustainability that reduce energy consumption, CCTV cameras for road intelligence, traffic signals, and open Wi-Fi in parks and libraries.

There is great diversity of strategies and projects in the above ten cities. It appears that a major concern of smart city initiatives is growth, the creation of knowledge and innovation districts, clusters, and digital environments for business support. Very strong too is the concern for sustainable city infrastructures, improving energy efficiency, use of renewable energy, water savings, waste management and green transportation. These core orientations are coupled with projects for better living, e-health, education, safety and security. All these require good broadband infrastructure and in many cases sensor networks for data collection and real-time solutions.

More recent is the book "Smart City Emergence" edited by Leonidas Anthopoulos and published in the <u>Elsevier Smart Cities series</u> (2021). The aim of this book is to collect and present information from several cities around the globe with regard to their Smart City development. It presents how different cities have approached the Smart City; the vision that they defined for their SC and the problems they

wanted to solve with the corresponding smart solutions; the projects that were launched and the timeline for their development; the corresponding budgets and the implementation methodologies, etc.

Following a chapter on project management, 20 city reviews are included in the book that highlight how different cities have organised their smart city process. 45 authors contributed to these reviews and the cities are from all the continents. While some projects and initiatives are relatively simple, others require complex efforts of articulation between the public sector, private sector, and citizens, digital and non-digital systems. Renovation of urban areas, smart lighting and traffic lights, solutions for the development of a creative economy, coworking spaces, and projects for start-ups are among them.

An overview of the cities, projects and the domain of reference is given in the Table below. All cities have implemented also projects related to broadband networks, wi-fi, and open wi-fi. Broadband together with cloud computing form the basic infrastructure on which all other projects and services operate. Among the many conclusions that we can draw from this Table what styands out is the design of projects by city ecosystems. We can identify 16 ecosystems that fall into three groups

- Area-based ecosystems: district renewal, hub district (port / rail / airport), university campus, housing
- Activity-based ecosystems: startups and innovation, safety, living, health, education, tourism and hospitality, shopping, governance
- Network-based ecosystems: broadband, mobility, energy, environment, water, circular economy, recycling, waste

These three types of ecosystems have quite different locational behaviour: area-based ecosystems cluster spatially to form city districts, activity-based ecosystems spread throughout the city, and network-based ecosystems locate along the axis and transport networks.

The ecosystem perspective in the making of smart cites justifies the system of (eco)systems understanding of cities. Challenges, problems, stakeholders, and activities differ from one ecosystem to another. Ecosystems define the context and the dynamics of change. Usually many projects, independent or integrated, are needed to change an ecosystem. Still, the smart city implementation landscape is fragmented in vertical markets (energy, mobility, governance, real-estate, etc.) with little interoperability and exchange. Smart city projects follow this fragmentation, and the ecosystem of reference defines the type of intervention, the solutions and know-how available, and the potential for change.

The next generation of smart cities sould deal with this fragementation, developing platforms with higher interoperability and common solutions across city ecosystems.

City	Sector /	Projects
	ecosystem	
Evora	Energy	• Smart meters, smart homes
(Portugal)		Smart grid
		Public lighting
Smart City of Evora		• EV charging
		• Data collection & modelling of energy system
	Environment	Reduction of CO2 emissions
		Building retrofitting
		• Solar thermal and solar PV
		• Recycling
		Promotion of cycling
		Traffic restrictions
		Biofuel buses
Torino	Mobility	• Bike-sharing
(Italy)		• Plan bicycle path

## Smart city projects by ecosystem

Smart City of Torino		<ul> <li>EV sharing</li> <li>Car-sharing service</li> <li>Car-pooling</li> <li>Traffic zone regulation (restriction)</li> <li>Traffic monitoring</li> </ul>
	Environment	District renewal     Smort courses
	Startups, innovation, skills	<ul> <li>Sinart squares</li> <li>Social innovation / startup support</li> <li>Youth employment</li> <li>Support for public goods and services</li> </ul>
	Living, safety, health	<ul> <li>Citizen awareness solutions</li> <li>Safety solutions</li> <li>Active aging</li> </ul>
	Tourism	<ul> <li>Information sharing</li> <li>Points of interest, city tourism</li> <li>Torino as a platform</li> </ul>
	Governance	<ul> <li>Health services from home</li> <li>Opening of public spaces to citizens</li> <li>Co-designing public services</li> </ul>
	Energy	<ul> <li>Energy action plan: retrofitting, PV panels, RES, LED</li> <li>IoT in schools for energy metering and saving</li> </ul>
Leuven (Belgium)	<i>Mobility</i> (under optimization of	<ul> <li>Last mile delivery vehicles</li> <li>Semi-autonomous bus shuttle</li> <li>Bike-sharing</li> </ul>
Smart City Leuven	<i>Energy</i> (under optimization of streams)	<ul> <li>Policing of shop and parking by sensors</li> <li>Smart city lights and sensor network</li> <li>Smart energy grid - interoperability</li> <li>Smart energy in building</li> </ul>
	Governance	<ul> <li>Data platform for city administration</li> <li>Open data to share data with citizens and entrepreneurs</li> <li>Digital Citizen: a digital profile of each citizen</li> </ul>
	Health	<ul> <li>Living Lab for health(care) innovations</li> <li>E-Health site</li> <li>Vital City-innovative initiatives for active lifestyle</li> <li>Testing wearables to improve health</li> </ul>
	Education	<ul> <li>University student collaboration</li> <li>Working environment for knowledge workers</li> <li>Start-ups in residence</li> </ul>
Vienna (Austria) Smart City of Vienna	Energy	<ul> <li>ICT integration for buildings and electrical grid Wien- Aspern (Grid, RES, and storage)</li> <li>Wien energy. Use of block-chain for transactions</li> <li>Clean heat, stable power grid. Excess electricity to heat</li> </ul>
		<ul> <li>Energy monitoring and intelligent plant control in Airport</li> <li>Urban Cool Down. Summer cooling in urban districts</li> </ul>
	Education	<ul> <li>Make your city smart: toolkit for do-it-yourself building</li> <li>Vocational orientation of future jobs, robotics, apps, RES</li> <li>Digital agenda Vienna. Interactive development of ideas</li> <li>Digital city: ICT education</li> </ul>
	Governance	<ul> <li>Sag's Wien application. Report to the city administration</li> <li>e-Government online services, registration, e-signature</li> </ul>
	Mobility	<ul> <li>Smart traffic lights</li> <li>Car sharing, e-cars</li> </ul>
	District renewal	• Renovation of former industrial sites, central station, Danube bank, residential areas, and other
Amsterdam (The Nethedlands)	Digital city	<ul><li>IoT and sensors</li><li>Digital infrastructure</li></ul>

Amsterdam Smart City		• Promotion of various advanced technologies (Blockchain, 5G, AL Drones)
(hundreds of initiatives at	Energy	<ul> <li>Energy atlas Open data map and RES usage</li> </ul>
https://amsterdamsmartcity.com/	Energy	<ul> <li>Energy transition</li> </ul>
A few are included)		Smart grid
		<ul> <li>Energy saving at home in city neighbourhoods</li> </ul>
		<ul> <li>Next-generation renewable energy digital platform</li> </ul>
	Mobility	<ul> <li>Mobility as a service</li> </ul>
	moonny	<ul> <li>City logistics</li> </ul>
		<ul> <li>Bicycle sharing</li> </ul>
		Autonomous vehicles
		<ul> <li>Crowd monitoring</li> </ul>
		• Electric vehicles
	Circular city	Building and construction
		• Public awareness
		• e-Waste
		• Make the circular economy and the upcycle visible
		• Design-driven solutions to waste and consumerism
		• New products from used pieces of plastics & metal
	Governance and	• Transition from smart to inclusive city
	education	• Up-scaling
		• Input-output modelling for smart city development
	Citizen and living	Public participation
	U U	• Living labs
		• Healthy urban living
		• Sharing economy
		• Social entrepreneurship
		Clean air monitoring
Trikala	Mobility	Smart parking and parking analytics
(Greece)		Municipal fleet management
Smart City of Trikala		• Fleet analysis with vehicles position and routes
		Traffic lights monitoring for malfunction
	Energy	• Smart lighting, upgrade to LED and motion sensors
	Waste	• Smart bins with sensors installed
	Water	Smart water metering
	Environment	Sensor-based monitoring and metering
	Governance	• Public wi-fi
		• End-to-end city management system
		GIS geospatial information
		• Complaint registration and mobile app
		Public consultation
		Digital payments
Smart Cities in Korea	Governance	• Gov with government agents
A		Citizen cooperation
A common model for all		Public-private partnership
ICT based growth	<u></u>	Integrated policy legal system
ecosystems in cities	Startups,	• Innovation led sustainable growth
	innovation, skills	• Innovative start-up
		<ul> <li>Spaces for innovative job creation</li> <li>Chatering</li> </ul>
		Clustering     Seneed of imposed ive ideas
	Education	Spread of innovative ideas     Innovative adjustion
	Mobility	
	Fnorgy &	Smart city technologies
	Environment	<ul> <li>Integrated infrastructure with ICT</li> </ul>
	Health	Open data
	Safety,	• Big data

Hangzhou (China)         Startups, innovation, skills         • Attraction of high-quality overseas talents in ICT, innovation, skills           Dream Town Internet village         • Arraction of high-quality overseas talents in ICT, innovation, skills         • Applications of c-business, software design, information services, big data, security, animation design           Dream Town Internet village         • Arraction of high-quality overseas talents in ICT, innovation, skills           Other and the security, animation design         • Start-up support           • Changsha (China)         • Government         • Services for social insurance, taxation, police           • Changsha (China)         • Government         • Services for shopping and online payment           • Collaboration and uservices, organment         • Services for shopping and online payment           • Fire protection         • Police colud big data platform           • Police colud big data platform         • Police colud big data platform           • Police colud big data platform         • Police colud big data platform           • Police colud big data platform         • Police colud big data platform           • Safety         • Smart metering           Smart City of Pune         • Safety         • Smart metering           Mobility         • Safety         • CCTV           Singapore         Signapore         Smart areagement platform		Welfare	• Data sharing and integration
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Pune (India)       Energy       • Police cloud big data platform • Police analytics and prediction         Smart City of Pune       Smart retering Mobility       • Smart retering • e-Buses • Electric Rickshaw / Electric Tuk-Tuk in Pune • ICT-enabled bus • Smart parking • Adaptive traffic management         Safety       • CCTV • IT connectivity         Nara (Japan)       District renewal         Singapore (Singapore)       District renewal         Singapore (Singapore)       Health         Smart City of Singapore       Electric analytics • App: User engagement on environmental issues • App: User engagement on environmental issues • App: User engagement on environmental issues • App: Understand living conditions at home • Citizen database platform -interaction with gov. • Access to public transportation • Mobility analytics • Smart parking • Autonomous mobility testing         Government       • Citizen database of business opportunities • Innovation, skills • Digital transactions for citizens and businesses • Digital transing programs and fellowships • Digital transactions for accelemic on these encouration • Businesses grants portal		Safety	• Fire protection
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(India)       Water       • Smart metering         Smart City of Pune       • Smart metering       • e-Buses         Smart City of Pune       • Electric Rickshaw / Electric Tuk-Tuk in Pune         ICT-enabled bus       • Smart parking         Adaptive traffic management       • CCTV         ICT-enabled bus       • Smart campus         Stafety       • CCTV         IT connectivity       • Smart campus         Smart City of Nara       • Smart nousing district         Singapore (Singapore)       • Health         Smart City of Singapore       • Elderly mobility using robotics         Simart City of Singapore       • App: Understand living conditions at home         Mobility       • Access to public transportation         Mobility       • Access to numerous public services         Open dataset       • Citizen database oplatform-interaction with gov.         Access to numerous public services       • Open dataset         Platform for sharing ideas       • Financial database of business opportunities         Innovation, skills       • Digital transing programs and fellowships         Digital transing programs and fellowships       • Digital transing programs and fellowships         • Digital transing programs and fellowships       • Digital transportation         Mobility       <	Pune	Energy	• Smart grid and solar panels
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Smart City of Pune <ul> <li>Electric Rickshaw / Electric Tuk-Tuk in Pune</li> <li>ICT-enabled bus</li> <li>Smart parking</li> <li>Adaptive traffic management</li> </ul> Nara             (Japan) <i>Safety</i> <ul> <li>CCTV</li> <li>IT connectivity</li> <li>Smart campus</li> <li>Smart privily</li> <li>Smart campus</li> <li>Smart campus</li> <li>Smart privily</li> <li>Smart campus</li> <li>Solar thermal</li> <li>Electric Rickshaw / Electric Tuk-Tuk in Pune</li> <li>ICT-enabled bus</li> <li>Smart campus</li> <li>Smart campus</li> <li>Smart campus</li> <li>Smart campus</li> <li>Smart privily</li> <li>Smart privily</li> <li>Smart parking</li> <li>App: Curre meanables encouraging exercise</li> <li>Health monitoring at home</li> <li>Health calated analytics</li> <li>Smart parking</li> <li>App: Understand living conditions at home</li> <li>Access to public transportation</li> <li>Mobility</li> <li>Access to public transportation</li> <li>Mobility analytics</li> <li>Smart parking</li> <li>Citizen database platform-interaction with gov.</li> <li>Access to numerous public services</li> <li>Open datasets</li> <li>Platform for sharing ideas</li> <li>Financial database of business opportun</li></ul>		Mobility	• e-Buses
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(Japan)       Smart Nitriki       Smart Varya         Smart City of Nara       Smart Numinian       Smart Numinian         Singapore       Solar thermal       Energy management platform         (Singapore)       Data centre       Data centre         Singapore       Health       Elderly mobility using robotics         (Singapore)       App citizen wearables encouraging exercise         Smart City of Singapore       Health         Living       App citizen wearables encouraging exercise         Mobility       App: Understand living conditions at home         Mobility       Access to public transportation         Mobility       Access to public transportation         Mobility       Citizen database platform-interaction with gov.         Access to numerous public services       Open datasets         Platform for sharing ideas       Platform for sharing ideas         Startups, innovation, skills       Financial database of business opportunities         Digital training programs and fellowships       Digital training rograms and fellowships         Digital training programs and fellowships       Digital training programs and fellowships         Digital tools for innovative development       Platforms for academic collaboration         Business grants portal       Data analytics platform (B2B, B2C, open gov data, cri	Nara	District renewal	Smart campus
Smart City of Nara       Smart grid and solar panel         Singapore       Energy management platform         Singapore       Health         Singapore       App citizen wearables encouraging exercise         Smart City of Singapore       Health         Smart City of Singapore       App citizen wearables encouraging exercise         Living       App: User engagement on environmental issues         App: Understand living conditions at home       Access to public transportation         Mobility       Access to public transportation         Mobility analytics       Smart priking         Government       Citizen database platform-interaction with gov.         Access to numerous public services       Open datasets         Platform for sharing ideas       Platform for sharing ideas         Startups, innovation, skills       Financial database of business opportunities         Digital transactions for citizens and businesses       Digital transactions for citizens and businesses         Digital tools for innovative development       Platform for sharing orden         Newark       Government       Data analytics platform (B2B, B2C, open gov data, crime, vacaut lots, employment)	(Japan)		Smart housing district
Smart City of Nara       Solar thermal         Singapore       Solar thermal         Singapore       Health         Singapore)       Elderly mobility using robotics         Smart City of Singapore       Health         Smart City of Singapore       Health         Iving       App citizen wearables encouraging exercise         Health monitoring at home       Health monitoring at home         Mobility       App: User engagement on environmental issues         App: Understand living conditions at home       Mobility         Mobility       Access to public transportation         Mobility       Access to public transportation         Mobility analytics       Smart parking         Government       Citizen database platform-interaction with gov.         Access to numerous public services       Open datasets         Platform for sharing ideas       Financial database of business opportunities         Startups, innovation, skills       Financial database of business opportunities         Digital transactions for citizens and businesses       Digital transactions for citizens and businesses         Digital transactions for citizens and businesses       Digital transactions for citizens and fellowships         Digital tools for innovative development       Platforms for academic collaboration         Busine			Smart grid and solar panel
Singapore (Singapore)       Health       Elderly monagement platform         Singapore)       Health       Elderly mobility using robotics         Smart City of Singapore       App citizen wearables encouraging exercise         Health related analytics       Health related analytics         Living       App: User engagement on environmental issues         App: Understand living conditions at home         Mobility       Access to public transportation         Mobility       Access to public transportation         Government       Citizen database platform-interaction with gov.         Access to numerous public services       Open datasets         Platform for sharing ideas       Financial database of business opportunities         Startups, innovation, skills       Financial database of business opportunities         Digital transactions for citizens and businesses       Digital transactions for citizens and businesses         Digital transportation       Business grants portal         Newark (US)       Government       Data analytics platform (B2B, B2C, open gov data, crime, vacant lots, employment)	Smart City of Nara		<ul> <li>Solar thermal</li> </ul>
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(Singapore)       Infinition of the product of the produ	Singapore	Health	Elderly mobility using robotics
Smart City of Singapore <ul> <li>Health monitoring at home</li> <li>Health related analytics</li> <li>App: User engagement on environmental issues</li> <li>App: Understand living conditions at home</li> </ul> Mobility <ul> <li>Access to public transportation</li> <li>Mobility analytics</li> <li>Smart parking</li> <li>Autonomous mobility testing</li> </ul> Government <ul> <li>Citizen database platform-interaction with gov.</li> <li>Access to numerous public services</li> <li>Open datasets</li> <li>Platform for sharing ideas</li> </ul> Startups, <ul> <li>innovation, skills</li> <li>Financial database of business opportunities</li> <li>Digital transactions for citizens and businesses</li> <li>Digital transport development</li> <li>Platforms for academic collaboration</li> <li>Business grants portal</li> </ul> Newark <ul> <li>(US)</li> <li>Government</li> <li>Covernment</li> <li>Data analytics platform (B2B, B2C, open gov data, crime, vacant lots, employment)</li> </ul>	(Singapore)		<ul> <li>App citizen wearables encouraging exercise</li> </ul>
Smart City of Singapore <ul> <li>Health related analytics</li> <li>Health related analytics</li> <li>App: User engagement on environmental issues</li> <li>App: User engagement on environmental issues</li> <li>App: Understand living conditions at home</li> </ul> Mobility <ul> <li>Access to public transportation</li> <li>Mobility analytics</li> <li>Smart parking</li> <li>Autonomous mobility testing</li> <li>Citizen database platform-interaction with gov.</li> <li>Access to numerous public services</li> <li>Open datasets</li> <li>Platform for sharing ideas</li> </ul> Startups, innovation, skills <ul> <li>Financial database of business opportunities</li> <li>Digital transactions for citizens and businesses</li> <li>Digital transing programs and fellowships</li> <li>Digital tools for innovative development</li> <li>Platforms for academic collaboration</li> <li>Business grants portal</li> </ul> Newark (US)	(Singup or c)		<ul> <li>Health monitoring at home</li> </ul>
Living       • App: User engagement on environmental issues         • App: Understand living conditions at home         Mobility       • Access to public transportation         • Mobility       • Access to numerous mobility testing         • Citizen database platform-interaction with gov.       • Access to numerous public services         • Open datasets       • Platform for sharing ideas         • Financial database of business opportunities       • Digital transportions for citizens and businesses         • Digital training programs and fellowships       • Digital training programs and fellowships         • Digital tools for innovative development       • Platforms for academic collaboration         • Business grants portal       • Data analytics platform (B2B, B2C, open gov data, crime, vacant lots, employment)	Smart City of Singapore		Health related analytics
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• Smart parking         • Smart parking         • Autonomous mobility testing         • Citizen database platform-interaction with gov.         • Access to numerous public services         • Open datasets         • Platform for sharing ideas         Startups,         innovation, skills         • Financial database of business opportunities         • Digital transactions for citizens and businesses         • Digital training programs and fellowships         • Digital tools for innovative development         • Platforms for academic collaboration         • Business grants portal         Newark         (US)		1,200111,9	<ul> <li>Mobility analytics</li> </ul>
Government       • Autonomous mobility testing         Government       • Citizen database platform-interaction with gov.         • Access to numerous public services       • Open datasets         • Platform for sharing ideas       • Financial database of business opportunities         • Digital transactions for citizens and businesses       • Digital training programs and fellowships         • Digital tools for innovative development       • Platforms for academic collaboration         • Newark       Government       • Data analytics platform (B2B, B2C, open gov data, crime, vacant lots, employment)			Smart parking
Government       • Citizen database platform-interaction with gov.         • Access to numerous public services       • Open datasets         • Platform for sharing ideas       • Financial database of business opportunities         • Digital transactions for citizens and businesses       • Digital training programs and fellowships         • Digital tools for innovative development       • Platforms for academic collaboration         • Newark       Government       • Data analytics platform (B2B, B2C, open gov data, crime, vacant lots, employment)			<ul> <li>Autonomous mobility testing</li> </ul>
Soreriment       • Contraction of the database platform interaction with gov.         • Access to numerous public services       • Open datasets         • Platform for sharing ideas       • Financial database of business opportunities         • Digital transactions for citizens and businesses       • Digital training programs and fellowships         • Digital tools for innovative development       • Platforms for academic collaboration         • Newark       Government       • Data analytics platform (B2B, B2C, open gov data, crime, vacant lots, employment)		Government	Citizen database platform-interaction with gov
• Open datasets         • Open datasets         • Platform for sharing ideas         Startups, innovation, skills         • Financial database of business opportunities         • Digital transactions for citizens and businesses         • Digital training programs and fellowships         • Digital tools for innovative development         • Platforms for academic collaboration         • Business grants portal         Newark (US)		Government	<ul> <li>Access to numerous public services</li> </ul>
Startups,       • Platform for sharing ideas         Startups,       • Financial database of business opportunities         innovation, skills       • Financial database of business opportunities         • Digital transactions for citizens and businesses         • Digital training programs and fellowships         • Digital tools for innovative development         • Platforms for academic collaboration         • Business grants portal         Newark       Government         (US)			Open datasets
Startups, innovation, skills       • Financial database of business opportunities         • Digital transactions for citizens and businesses         • Digital transactions for academic collaboration         • Business grants portal         • Newark         (US)			<ul> <li>Platform for sharing ideas</li> </ul>
innovation, skills       • Digital transactions for citizens and businesses         • Digital transactions for academic collaboration         • Business grants portal         • Newark         (US)		Startups.	Financial database of business opportunities
		innovation. skills	<ul> <li>Digital transactions for citizens and businesses</li> </ul>
Digital dating programs and renowships     Digital tools for innovative development     Platforms for academic collaboration     Business grants portal     Otat analytics platform (B2B, B2C, open gov data, crime, vacant lots, employment)			<ul> <li>Digital training programs and fellowships</li> </ul>
• Platforms for academic collaboration         • Platforms for academic collaboration         • Business grants portal         • Newark         (US)			<ul> <li>Digital tools for innovative development</li> </ul>
Newark (US)     Government     Data analytics platform (B2B, B2C, open gov data, crime, vacant lots, employment)			<ul> <li>Platforms for academic collaboration</li> </ul>
Newark (US)Government• Data analytics platform (B2B, B2C, open gov data, crime, vacant lots, employment)			Business grants portal
(US) (US) (US) (US) (US) (US) (US) (US)	Newark	Government	<ul> <li>Data analytics platform (B2B_B2C_open gov data)</li> </ul>
	(US)		crime, vacant lots, employment)

		Industrial analytics platform
Smart city of Newark		Smart city governance analytics
Quayside Toronto	District renewal	• Self-driving shuttles
(Canada)		Robot delivery
		• Spaces showcasing new technologies
Sidewalk Labs' Waterfront		• Dynamic, reconfigurable pavement, allowing different
Toronto		uses and activities throughout the day
(before being abandoned)		Building envelope technologies (raincoats)
		Responsible Data Use Framework
Porto Alegre	Governance	Integrated command centre
(Brazil)		• GIS data centre
		• Bio-monitoring (trees, plant, pollutants)
Porto Alegre Smart City		• Training telecentres for literacy and digital inclusion
		Smart city innovation centre
	Health	• Real-time monitoring of hospital bed occupation
		Sharing patient information
		Telemedicine, primary diagnoses
Johannesburg	Safety	Crime reporting application
(South Africa)		• 911 response application
		• Kitestring – check-up and emergency alert
Smart city of Johannesburg	Mobility	Intelligent Transport System
		Interactive application – real time transport
Tunis	Startups,	• Digital entrepreneurship
(Tunisia)	innovation, skills	Digital innovation services
		• Offshoring – place promotion
Smart City of Tunis		IT promotion
	Governance	<ul> <li>Administrative services to citizens</li> </ul>
		• User-centric governance
		• Platform for data exchange and interoperability

Source: Based on city reviews of the book Anthopoulos (2021). Smart City Emergence: cases from around the world. Elsevier