Sensing Projects

The following projects utilise sensors in various forms.

Name	Purpose	Description	Status
Safe City Living Lab	The project aims to provide information for evidence based future planning and a more informed situational tactical response to local incidences and concerns by Council and its partners.	A platform called the Smart Board has been developed where information can be inputted to enable an integrated view through visualisation and analytic tools. The Smart Board centralises a number of agencies' existing data, such as records of accident locations, tagging incidents and crime reports, and adds new data captured via strategically placed sensors.	The project is being delivered over 3 stages. Stage 1: Trial (completed) Stage 2: Development of incident identification (commencing) Stage 3: Setting up appropriate internal and external access
Traffic Congestion	Provide traffic congestion and travel-time information on some arterial routes	Araflow Ltd provides Bluetooth sensing data that tracks the speed of Bluetooth devices in cars between various points across the city and suburbs. This allows us to track, real time and historic traffic congestion. NZTA also use this for their display signs that provide car users with information on travel times across the city.	Ongoing
Smart Parking	Manage paid parking in the CBD more efficiently by gathering real time information on whether parks are occupied and paid for. Provide information on available parks to the public.	In 2016 around 3000 sensors supplied by Smart Parking Limited were installed on carparks throughout the Wellington CBD. Since installation the Council has receiving detailed occupancy and turnover information for every metered car parking space, in order to more efficiently manage city parking operations. The sensors do not identify vehicle registration details. Anonymised data from this is being fed through to NEC and is integrated onto the trial 3D visualisation of the city.	The team is now looking at options for providing further information on available parks to the public. This includes a mobility card holder project in partnership with CCS Disability Action who provides support and advocacy for people with a disability.

Smart Lighting	This project seeks to reduce energy consumption in the street light network and allow more granular control of street light operation including fault detection and brightening/dimming for appropriate visibility requirements	Initial phase of project involves replacing sodium luminaires with LED (using less power) and ensuring they have the appropriate radio fittings for a smart lighting network at a later date. The Smart lighting part of the project will provide the individual control necessary to maximise savings and customise deployment of the street lighting across the city.	On hold pending access to national subsidised funding and/or a viable business case for cost savings
Pedestrian Mobility	There are a number of potential uses for the data captured in this project: • accurate counts of people at free events like CubaDupa and Newtown Fair to enable better economic impact assessment • accurate before and after flow information for urban design projects to inform better city design decisions • pedestrian numbers to sales conversion information for retailers to inform operational efficiencies • predictive analytics for resourcing events and activities	This project involves deploying stereoscopic cameras which will give us real pedestrian counts at specific pedestrian entry/exit points throughout the city. We can then calibrate these with the number of discrete wifi and cellular data devices in the same area to provide us with ground truth calibration which increases the accuracy of people counts, and allows us to extrapolate pedestrian numbers and flow across the city. The plan is to eventually add this data to the 3D visualisation of the city. NB. There is no need to record or retain the actual camera footage beyond the processing time (approx.. 10 minutes). Pedestrian count data is anonymised as an integral part of the data collection process.	Stage 1: Testing at the ASB Arena for calibration - completed Stage 2: Testing within the Rail/Bus interchange precinct. – underway Stage 3: We may deploy stereoscopic cameras in other locations across the city to increase count accuracy Stage4: Pedestrian count and flow information will be integrated into the trial 3D visualisation of the city

| Building seismic sensing network | This project will:
• enable evidenced-based decision making around building and city safety immediately following a seismic event.
• enable us to make instant decisions about the safety and suitability of some of our larger building assets that may be needed to accommodate displaced people following a seismic event
• inform which buildings should be prioritised for inspection and upgrade work and potentially assist with assessing what upgrade work is needed
• improve design of new buildings
• aid business continuity – allowing earlier occupation of safe buildings post event.
• increase understanding of performance of structures on various ground formations to enable more targeted decision-making with respect to city planning | This is an early stage project in partnership with GNS and Wellington building owners. It will involve installing accelerometers in buildings, on key infrastructure and increasing ground sensors across the city. It will also require development of a data backhaul system, software to quickly analyse the data from the sensors and provide rapid, accurate information to decision makers immediately following a seismic event. | Discussions underway with stakeholders |

Air Quality	The purpose of this project would be to gather real-time information on the air quality along major public transport routes in Wellington City where there are a high number of buses and pedestrians in order to ensure that the decisions made around transport routes and forms are based on accurate data	In partnership with Great Wellington Regional Council and NZTA, this project would involve selecting, calibrating and placing appropriately priced real time air particle sensors at points along the transport corridor.	This project is still at a very early stage. It's not something we 'know' we can do, as accurate, affordable sensors measuring oxides of nitrogen and particle matter are yet to become available.
Predator Free and Bird Identification	The purpose of this project is to understand the regeneration of native species outside Zealandia. Data may also be used in the predator free programme.	NEC, working with open source freeware has developed a method for identifying birds by species using a receiving unit and machine learning to detect individual species bird song. Working with Victoria University we are using a sound detection tool to register incidences of birds detected by the digitised pattern of their unique sound and note their presence in a particular area of the city, allowing us to note their regeneration areas.	A trial receiving unit is set to be deployed in Zealandia

Enabling Projects

The following projects do not utilise sensors as their primary function but form part of the broader picture of readily utilising the data captured by the sensors.

Name	Purpose	Description	Status
Kite Network	A sensing platform typically includes gateway devices that collect data coming from a number of sensors and moves them on to a backhaul network (like cellular, wifi or fibre). These devices require power and backhaul connection as well as mounting on a suitable pole. This caused a 6 month delay to one of the safe city sensor deployments. This project seeks to reduce the cost and time of the civil works associated with deploying sensors by implementing a cheaper more efficient alterative to collect and transfer the data captured to a centralised location.	The Kite is a device co-created with NEC as an alternative to more traditional gateway devices. Kite is a flexible sensor platform designed for deployment individually or as part of a city hub. Kite allows a city to set up a single backbone that can be accessed by all interested parties. Sensors are easily connected to the Kite platform and Kite's software translates the sensor information into a standardised data format that is centrally and securely managed. Around 20 Kite devices have been installed around Wellington City and are working well.	NEC has started work on how this project might transition to a product; we are currently leaning toward an 'as a service' model. Once we have worked through how a more commercial arrangement might work we will develop a business case.
Smart City Backbone / Cloud City Operation Centre	Allows map-based visualisation of various data-sets to enable understanding and therefore improve decision making.	Smart City Backbone or Cloud City Operation Centre (CCOC) is a platform developed and deployed as part of European Union driven Smart-Cities initiative that Council and NEC have deployed a Wellington instance of. It is fundamentally a city dashboard.	Smart City backbone proof of concept is in place and now aggregating data from the Araflow traffic congestion mapping project, air temperature and humidity data. This may be replaced by the 3D model.

3D Visualisation	Allows map-based visualisation of various data-sets to enable understanding and therefore improve decision making.	This is a model of the city, built by NEC, using a gaming engine. The elements of the city are built off WCC data sets so are easily updated.	Data layers we are working with currently include soil permeability, car park occupation and census population density.

Copies of any Privacy Impact Assessments or similar reports prepared or received in relation to this project.	
Safe City Living Lab	Attached is the original PIA that was worked on with the Privacy Commissioner. As the project has developed we are now collecting some personal information. We are currently in the process of updating the PIA to reflect these changes and can share this with you when it is completed.
Traffic Congestion	No PIA prepared as no personal information captured
Smart Parking	No PIA prepared as no personal information captured
Smart Lighting	No PIA prepared as no personal information captured
Pedestrian Mobility	No PIA has been prepared at this stage as no personal information has been captured. We will be closely monitoring this project and will prepare a PIA if we believe there is any chance that personal information may be captured accidentally.
Building seismic sensing network	No PIA prepared as no personal information captured
Air Quality	No PIA prepared as no personal information captured
Predator Free and Bird Identification	No PIA prepared as no personal information captured
Kite Network	No PIA prepared as no personal information captured
Smart City Backbone / Cloud City Operation Centre	No PIA prepared as no personal information captured
3D Visualisation	No PIA prepared as no personal information captured

Copies of material produced to share with the Privacy Commissioner, and any responses received from them.	
Safe City Living Lab	Attached is correspondence with the OPC in relation to the Safe City Living Lab over time
Traffic Congestion	No information held
Smart Parking	No information held
Smart Lighting	No information held
Pedestrian Mobility	Attached is correspondence with the OPC to date regarding the Pedestrian Mobility project
Building seismic sensing network	No information held

Air Quality	No information held
Predator Free and Bird Identification	No information held
Kite Network	No information held
Smart City Backbone / Cloud City Operation Centre	No information held
3D Visualisation	No information held

Technical descriptions of the architecture of the systems, including links to other systems owned by the council or third parties.	
Safe City Living Lab	Please refer to Privacy Impact Assessment
Traffic Congestion	Araflow Ltd provides Bluetooth sensing data that tracks the speed of Bluetooth devices in cars between various points across the city and suburbs. This allows us to track, real time and historic traffic congestion. NZTA also use this for their display signs that provide car users with information on travel times across the city.
Smart Parking	Please see *Smart Parking Brochure-New Zealand* attached, no other relevant information is held by Council
Smart Lighting	No technical description of architecture is held by Council
Pedestrian Mobility	No technical description of architecture is held by Council
Building seismic sensing network	No technical description of architecture is held by Council
Air Quality	No technical description of architecture is held by Council
Predator Free and Bird Identification	No technical description of architecture is held by Council
Kite Network	No technical description of architecture is held by Council
Smart City Backbone / Cloud City Operation Centre	No technical description of architecture is held by Council
3D Visualisation	No technical description of architecture is held by Council

Technical descriptions of the range and type of sensors used in the systems (we are mainly concerned with their capabilities).	
Safe City Living Lab	Currently utilising a visual sensor and looking at adding an acoustic sensor. Visual and acoustic sensors are used in conjunction with machine-learning to detect certain behaviour types. The acoustic sensor technology has not yet been developed – it is likely to occur in the next 6 – 12 months. Visual sensors: fighting, physical impairment caused through substance use (most likely alcohol or illegal drug consumption), crowding and begging Each sensor seeks to identify one of the behaviours above. To develop the analytic the visual/acoustic recordings are analysed and an algorithm is

	developed to recognise each behaviour type to enable the sensors to automatically detect such behaviours without relying on manual human intervention or people having to view actual captured video. When certain behaviour is detected the sensor will send an alert to the smart board. This alert captures the metadata of the incident (date, time, location) and either an image or 30 second video/audio snippet, which is retained in accordance with the PIA.
Traffic Congestion	Araflow Ltd provides Bluetooth sensing data that tracks the speed of Bluetooth devices in cars between various points across the city and suburbs. This allows us to track, real time and historic traffic congestion. NZTA also use this for their display signs that provide car users with information on travel times across the city.
Smart Parking	Please see *Smart Parking Brochure-New Zealand* attached, not other relevant information is held by Council
Smart Lighting	No sensors deployed at this stage
Pedestrian Mobility	We are in the beginning phase of looking at a people flow project which utilises two sensors 1) stereoscopic cameras 2) wifi sensors Stereoscopic Cameras are used to count pedestrians as they pass through the camera's field of view. The data is summarised on the camera and at pre-set intervals, the data is sent via a secure network to the datacentre for consolidation. The data collected by the camera consists of the camera's id, and the number of people entering or leaving the cameras field of view. No images are held, nor is video recorded. The cameras have been configured to not be able to communicate via the internet. The Wifi sensors only detect the MAC address of the Wifi devices in the proximity of the sensor. Software in the sensor performs MAC Address anonymization via a one way industry standard cryptographic hashing algorithm salted with a secret key and the original MAC address is discarded. The anonymised address is then sent to the datacentre for reporting purposes. The anonymised addresses are not stored at the edge device unless the communications link between the sensor and the datacentre is temporarily interrupted at which point they are cached until connectivity is re-established. The sensors communicate to the datacentre via a private APN which is locked to the SIM card ID.
Building seismic sensing network	No Information held
Air Quality	No Information held
Predator Free and Bird Identification	No Information held
Kite Network	N/A this project is an enabling project and does not itself utilise sensors
Smart City Backbone / Cloud City Operation Centre	N/A this project is an enabling project and does not itself utilise sensors
3D Visualisation	N/A this project is an enabling project and does not itself utilise sensors

Information about personally identifiable information captured (including device MAC and IMEI addresses, car registration details, photos of people's faces, etc), how this is stored, and who it is made available to	
Safe City Living Lab	The original PIA concluded that the Safe City Living Lab analysed personal information but did not capture it. As the project has developed we are now collecting some personal information under specified circumstances (when triggered by alerts), including: • Image snippets • Video recording • Video snippets • Alert photos • Incident data In the future the Living Lab may also capture • Audio snippets • Audio recording buffer The video component of the Safe City project is secured in its own network as above and is available to Police and Council Community Networks staff in secure environments. The video footage is managed in accordance with the Privacy Act the same way as the Council's existing CCTV cameras operate. When certain behaviour is recognised by the sensor the system takes a screenshot which is sent to the smart board called an alert. The alert includes either video/image snippet, date, time, and location where the alert was captured. The video/image is the only component which contains personal information – this is held for 90 days and then automatically deleted.
Traffic Congestion	No personal information captured
Smart Parking	No personal information captured
Smart Lighting	No personal information captured
Pedestrian Mobility	No personal information captured, please refer to the previous question for information about MAC addresses.
Building seismic sensing network	No personal information captured
Air Quality	No personal information captured
Predator Free and Bird Identification	No personal information captured
Kite Network	No personal information captured
Smart City Backbone / Cloud City Operation Centre	No personal information captured
3D Visualisation	No personal information captured

Whether and how facial recognition systems are used.	
All projects	We have no facial recognition systems

Whether and how people tracking systems are used.	
Safe City Living Lab	No people tracking systems utilised
Traffic Congestion	No people tracking systems utilised
Smart Parking	No people tracking systems utilised
Smart Lighting	No people tracking systems utilised
Pedestrian Mobility	We have no people tracking systems at present. We are looking at a people flow project (refer above) The main purposes of this are: • Better data to inform Urban design • Better information on numbers of people at city events to inform economic assessments • Better information on where to direct assistance in emergency situations where people are evacuated from part/s of the city.
Building seismic sensing network	No people tracking systems utilised
Air Quality	No people tracking systems utilised
Predator Free and Bird Identification	No people tracking systems utilised
Kite Network	No people tracking systems utilised
Smart City Backbone / Cloud City Operation Centre	No people tracking systems utilised
3D Visualisation	No people tracking systems utilised

Whether and how any device or sensor that could overhear people's conversations are used.	
Safe City Living Lab	No. We have trialled acoustic sensors but they have not in any instance overheard conversations. We are not currently using acoustic sensors.
Traffic Congestion	Does not utilise audio sensors
Smart Parking	Does not utilise audio sensors
Smart Lighting	Does not utilise audio sensors
Pedestrian Mobility	Does not utilise audio sensors
Building seismic sensing network	Does not utilise audio sensors
Air Quality	Does not utilise audio sensors
Predator Free and Bird Identification	When in use an acoustic sensor analyses all sounds within the vicinity of the sensor. It is programmed to detect certain sound patterns and frequencies such as native bird calls. They simply recognise the pre-defined patterns of native birds and (potentially if viably identifiable) predators, record the incidence as a species count.
Kite Network	Does not utilise audio sensors.
Smart City	Does not utilise audio sensors

Backbone / Cloud City Operation Centre	
3D Visualisation	Does not utilise audio sensors

Any documents, plans or reports containing predictions or plans for implementing further data collection or analysis as part of the system.	
Safe City Living Lab	We are in the process of developing a page for our website with information about these projects and we will let you know when that is operational. We are also planning to make any data that is not personal, (e.g., air quality) publically available.
Traffic Congestion	No Information held
Smart Parking	In the last City Strategy Committee there was discussion of using the sensor data when reviewing the parking policy. This is touched on in the below committee meeting report: http://wellington.govt.nz/~/media/your-council/meetings/committees/city-strategy-committee/2017/06/22/2017-06-22-agenda---city-strategy-committee.pdf
Smart Lighting	No Information held
Pedestrian Mobility	No Information held
Building seismic sensing network	No Information held
Air Quality	No Information held
Predator Free and Bird Identification	No Information held
Kite Network	No Information held
Smart City Backbone / Cloud City Operation Centre	No Information held
3D Visualisation	No Information held