This technical guide provides an overview of the different technologies and methods for collecting data on how people use public spaces. It should be read in conjunction with the relevant standards and legislation.

Taking a place-based approach to data

Smart places use technology and data solutions to make places more liveable, sustainable and economically vibrant for communities. All smart places:

- **embed sensors and communications technology** in infrastructure and the natural environment
- use the sensors and technology solutions to **capture, safely store, aggregate and share data**
- generate **information and insights** and communicate these to drive decisions.

Smart technologies can be used to generate insights on how people move in, around and through public spaces. This helps governments:

- better manage public space assets, so people can enjoy public spaces more
- plan for and meet the needs of the community with the right infrastructure and services
- measure the impact of investments in public space improvements and policies.

When shared and made openly available, this can also help businesses make decisions about their opening hours, rostering and the services they provide. This supports good economic activity.

Some examples include measuring:
- the number of people moving in and out of a park
- people using street furniture, and public infrastructure like playgrounds and BBQs
- people attending public events
- dwell time of people in and around transport hubs and bus stops.

The technologies and methods outlined in this guidance could be used in a range of scenarios, depending on the existing context and environment. For the best results, we recommend starting with the problem to be solved and not the technology solution.

Building trust when using smart technology

When considering smart technology in public places, we encourage you to reference the NSW Smart Places Customer Charter.

The Charter includes principles to guide the use of smart technologies in public spaces and using it will help to ensure you grow trust with your community. We also recommend you consider clear signage, providing opportunities for people to understand and engage with the technologies being used and the data being collected.

You can explore how Sydney Olympic Park Authority is using a communication standard to boost trust and transparency in this related case study.

How to read this guide

There are different ways to collect data about how people are moving through and using public spaces.. This guide takes a particular focus on active travel. It has built on the foundational work of the Sunshine Coast Council Smart Infrastructure Manual (2023) and we acknowledge their leadership and efforts in developing this content.

The following tables outline the key information needed to help understand the relevant data: a brief description (Table 1), and an evaluation of the practical considerations including advantages and limitations (Table 2).

More technical guidance

Unlock the full potential of connected smart places with our SmartNSW Playbook and other Technical Guidance documents. Consult your organisation for the relevant industry standards that apply to your development.

Table 1: Description of key terms

Technology/method	Description
Passive Infrared (PIR)	Sensor detects and counts when a beam of infrared light is broken.
nCounter (Bluetooth, Wi-Fi)	Device gathers information transmitted via mobile phones and other Wi-Fi / Bluetooth enabled devices to determine count and estimate dwell time.
Free Wi-Fi (if supplied by place owner)	Wi-Fi Router offers free public Wi-Fi. Device gathers information transmitted via mobile phones and other Wi-Fi enabled devices to determine count and estimate dwell time.
Radar	Sensor emits radio waves (mmWave) and catches the signal reflected from objects outputting position, shape, motion characteristics and trajectory of the detected objects.
Fixed camera with AI edge processing	Analytics where the processing of the video footage takes place at the point of the camera before the information is sent across the network.
Fixed camera with AI post processing	Analytics where the processing of the video footage takes place in a data storage centre after

Technology/method	Description
	the video is via the network.
Mobile camera trailer	The camera is mounted on a movable trailer and placed at the point where the data is to be collected. Either with AI edge or post processing (as per previous columns).
Mobile phone data	Data is collected by mobile and telecommunication companies on the location of the handset on their network.
Human observation	A person physically counts people at a specific point and records the information.

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Table 2: Evaluation of the practical considerations

Technology / Method	Passive Infrared (PIR)	nCounter (Bluetooth, Wi-Fi)	Free Wi-Fi (if supplied by place owner)	Radar	Fixed camera with AI edge processing	Fixed camera with AI post processing	Mobile camera trailer	Mobile phone data	Human observation
Accuracy	Good, location dependant	Good	Good	Good	Very good	Excellent	Excellent	Very good	Excellent
Considerations	Single point only, no path direction, sensitive to sunlight	Range	Range	Directionality and speed can be measured, signal influenced by weather	Counting algorithms improving, quality influenced by time of day, weather	Counting algorithms configured or customised after capture, can be further developed	Counting algorithms configured or customised after capture, can be further developed	Proprietary data collected by mobile companies	Additional characterisation of situation or site from observer, quality can degrade with complexity, duration or time of day
Cost (approx)	Very low	Low	Low-medium	Low-medium	Medium	Very high	Low-medium	High-very high	Very high
Installation	Temporary or Permanent	Temporary or Permanent	Permanent	Permanent	Permanent	Permanent	Temporary	None	Temporary
	Indoors Outdoor – Dry & dust-free	Both	Both	Both	Both	Both	Outdoors	Both	Both

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You should seek independent expert advice in relation to any specific digital infrastructure requirements you have.

Technology / Method	Passive Infrared (PIR)	nCounter (Bluetooth, Wi-Fi)	Free Wi-Fi (if supplied by place owner)	Radar	Fixed camera with AI edge processing	Fixed camera with AI post processing	Mobile camera trailer	Mobile phone data	Human observation
Privacy	Privacy compliant. No information captured. Uses heat mapping.	Privacy compliant. Information is de-identified. Uses mobile Wi-Fi or Bluetooth settings.	Privacy compliant. Information is de-identified. Uses mobile Wi-Fi settings.	Privacy compliant. No personal information captured. Uses radar to detect shapes.	Privacy compliant. Edge processing results in no private data leaving the camera.	Privacy compliant, subject to adhering to data management practices and de-identification.	Privacy compliant, subject to adhering to data management practices and de-identification.	Privacy compliant, subject to adhering to data management practices and de-identification.	Privacy complaint. Information captured using gate method to count.
Underlying Network for data transmission	LoRaWAN, Wi-Fi (Fibre, 4/5G)	LoRaWAN, Wi-Fi (Fibre, 4/5G)	Wi-Fi (Fibre, 4/5G)	Wi-Fi (Fibre, 4/5G)	Fibre, 4/5G, LoRaWAN (no image recording)	Fibre, 4/5G	Post collection transmission or 4/5G	4/5G networks in area needed	N/A
Power requirements	Low battery	Low/Mid – either solar & battery, or power connection	Mid - either solar & battery, or power connection	Low – either solar & battery, or power connection	Mid/High – either solar & battery, or power connection	High – either solar & battery, or power connection	High – self-contained power system / battery	N/A	N/A
Advantages	No sim card required	No sim card required	Provides free public Wi-Fi	No sim card required	Combination of high accuracy & low cost. Requires no	Combination of high accuracy & ability to manage	Combination of high accuracy, low relative cost (per use),	Can provide historical data. High accuracy depending on	Quick to deploy

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Technology / Method	Passive Infrared (PIR)	nCounter (Bluetooth, Wi-Fi)	Free Wi-Fi (if supplied by place owner)	Radar	Fixed camera with AI edge processing	Fixed camera with AI post processing	Mobile camera trailer	Mobile phone data	Human observation
					sim card	privacy	& ability to deploy quickly for short periods	granularity required	
Limitations	Does not always work well in open spaces with large amount of sunlight. Low accuracy. Low ingress protection rating.	Does not provide free public Wi-Fi. Only counts people with Wi-Fi or Bluetooth turn on mobile phones. Requires auditing to determine correlation. Does not count other things, e.g dogs.	Requires power. Only counts people with Wi-Fi connected mobile phones. Requires auditing to determine correlation. Does not count other things, e.g. dogs.	Can count people or vehicles, not dogs/other.	Requires power. Due to privacy settings does not track people.	Combination of high cost & privacy compliance. Due to privacy settings does not track people.	Combination of high cost & privacy compliance, if using second camera option. Due to privacy settings does not track people.	High cost and dependant on partner organisation. Potential loss of data once agreement is terminated.	Human error.

Note: Permanent installations require significant budget, approvals and time before hardware is available and installed.

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