

Radon Detection and Public Health Awareness

— to reduce risks of lung cancer: SDG Good Health & Wellbeing

M.A. Service Design, Royal College of Art - Boyoung Lee / Lin-Chen Lin



Royal College of Art



1 | PROJECT OVERVIEW

IMAGINE ...

**THIS IS HAPPENING, IN YOUR WORKPLACE
OR IN YOUR CHILDREN'S CLASSROOM**





SEEMS SCARY ?



INDOOR
AIR POLLUTION

90%
time spent indoors

8X
worse than outdoor

Source_
<https://www.buildinggreen.com/blog/we-spend-90-our-time-indoors-says-who>
<http://www.makeuseof.com/tag/6-smart-interior-air-quality-monitors-you-should-buy-for-your-home/>

RADON?



84%



67%

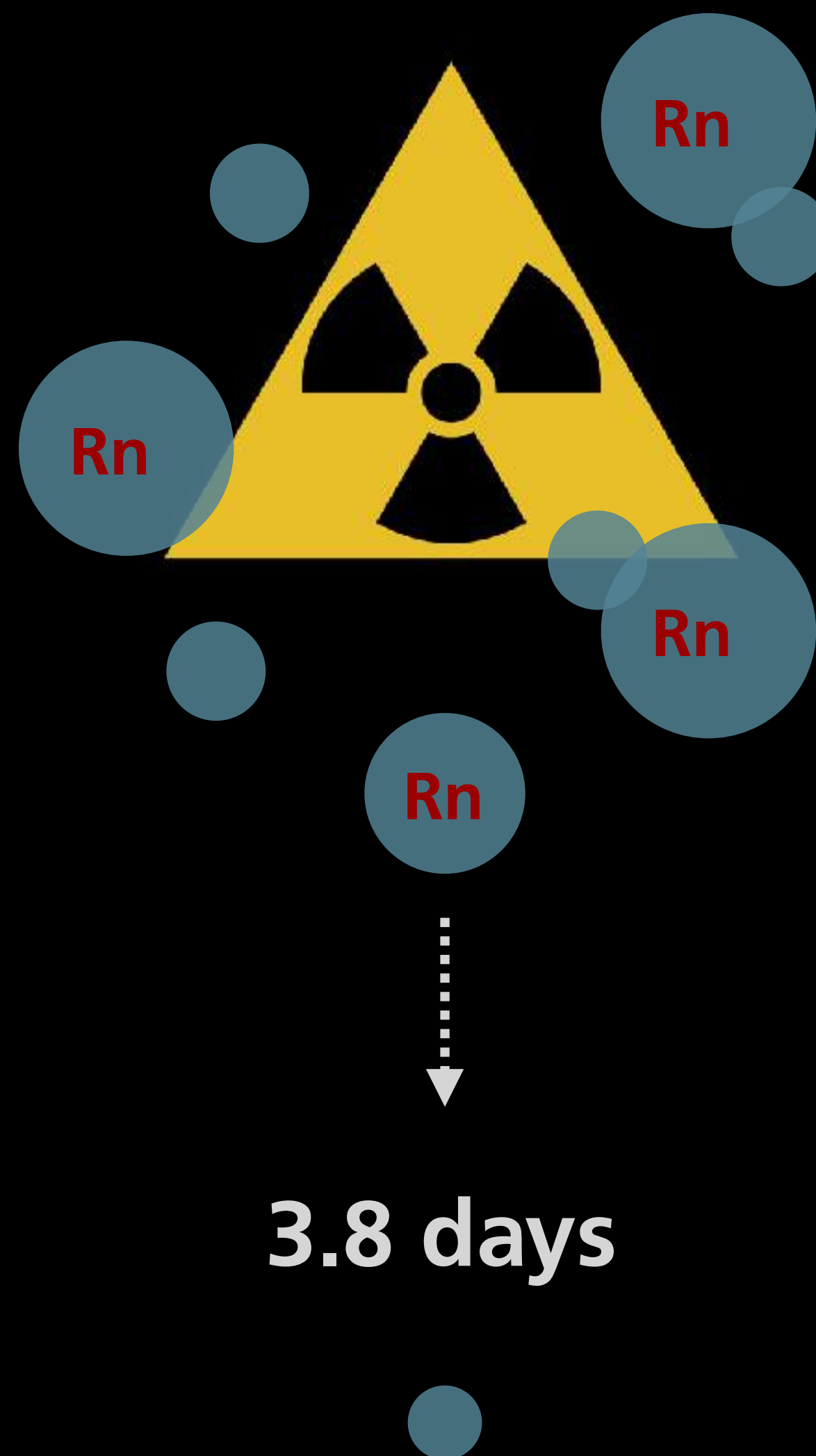


77%



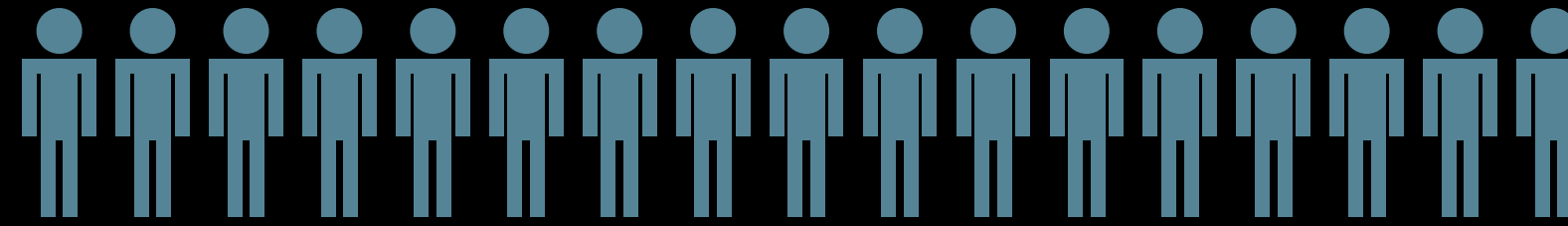
9%

DANGER OF RADON



DANGER OF RADON

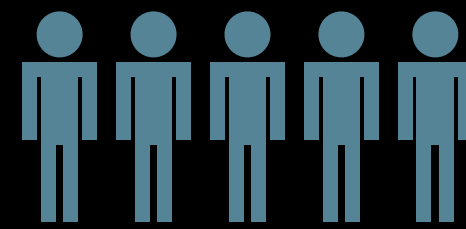
Road traffic accident



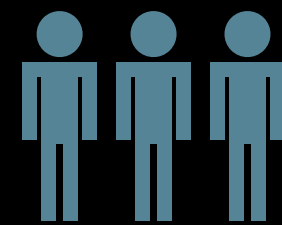
Radon related lung cancer



Food poisoning



Meningitis



Carbon monoxide poisoning



**DANGER OF
RADON**

20X
Higher risk

LUNG CANCER IN UK



Cases



New cases of lung cancer, 2014, UK

Third common
diagnosed cancer in UK

Deaths



Deaths from lung cancer, 2014, UK

Most common
cancer deaths in UK

Survival



Survive lung cancer for 10 or more years, 2010-11, England and Wales

Prevention



Preventable cases of lung cancer, UK

Mostly preventable

3 GOOD HEALTH



OUR TARGET SDG

By 2030, substantially reduce the number of deaths and illnesses from *hazardous chemicals and air*, water and soil pollution and contamination.

2 | CURRENT PRODUCT SERVICE ANALYSIS

EXISTING SERVICE

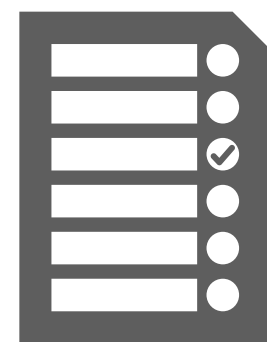


Public Health
England



UK Government Radon Home Measurement Pack

- £49.8/ service
- takes about **5 months** to get a result



Radon address search

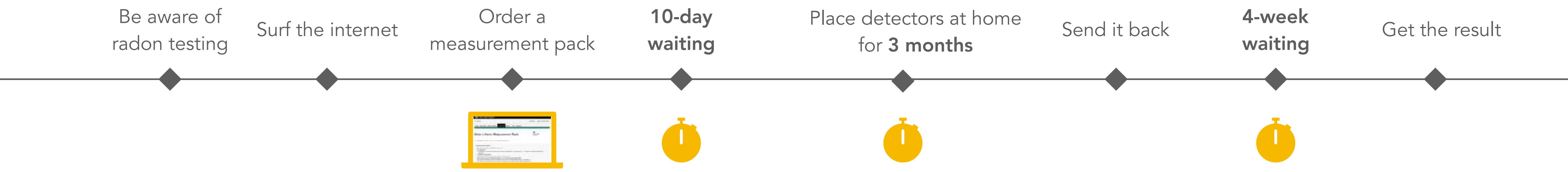
- £3.90 including vat.
- Instantly as a **PDF** to print or save.
- Any home or small workplace under 25 metres in length.

UK Government Radon Workplace Measurement Pack

- £20.75/ detector
- takes about **5 months** to get a result
- Invalid situation:
building work/ change in use during the test

Source_

<http://www.ukradon.org/services/orderdomestic>



Source_
<http://www.ukradon.org/services/orderdomestic>

5 MONTHS to get the result

Be aware of radon testing

Surf the internet

Order a radon measurement kit

10-day waiting

Place detectors at home for 3 months

Send it back

4-week waiting

Get the result



CURRENT MARKET



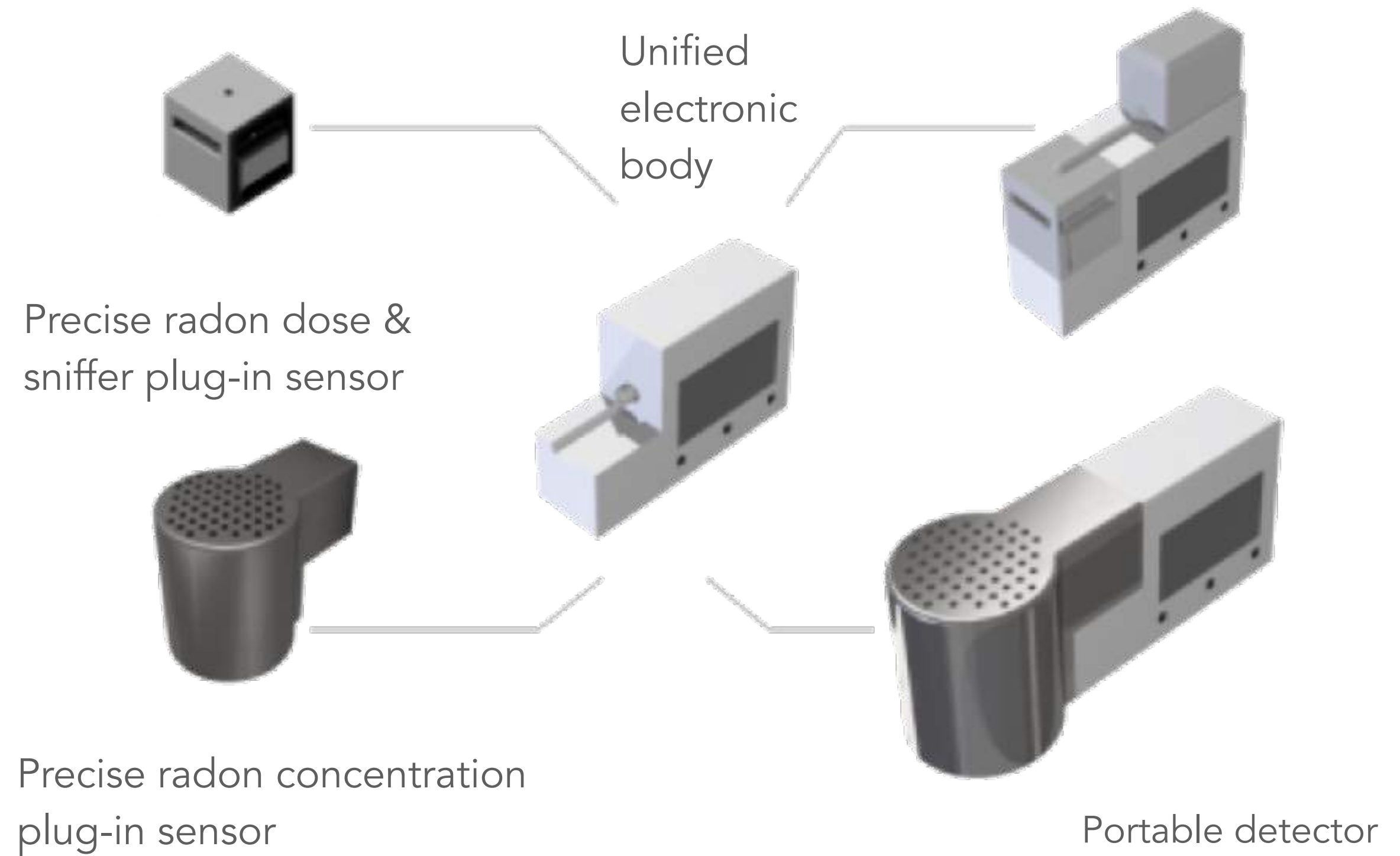
Name	Airthings Wave	Airthings Home	Airthings Plus	Airthings Pro
User	homeowners	homeowners	professionals	professionals
Cost	£169	£169	£759	£1269
Pros	easy to use, quick result, connected to mobile devices	easy to use, quick result, portable	easy to use, quick result, portable	accurate, long-term analysis, connected to mobile devices
Cons	accuracy	accuracy	expensive	expensive

3 | CERN'S KEY TECHNOLOGY LANDSCAPE

DEVELOPING PRODUCT_RaDoM Project @CERN

1 | PORTABILITY

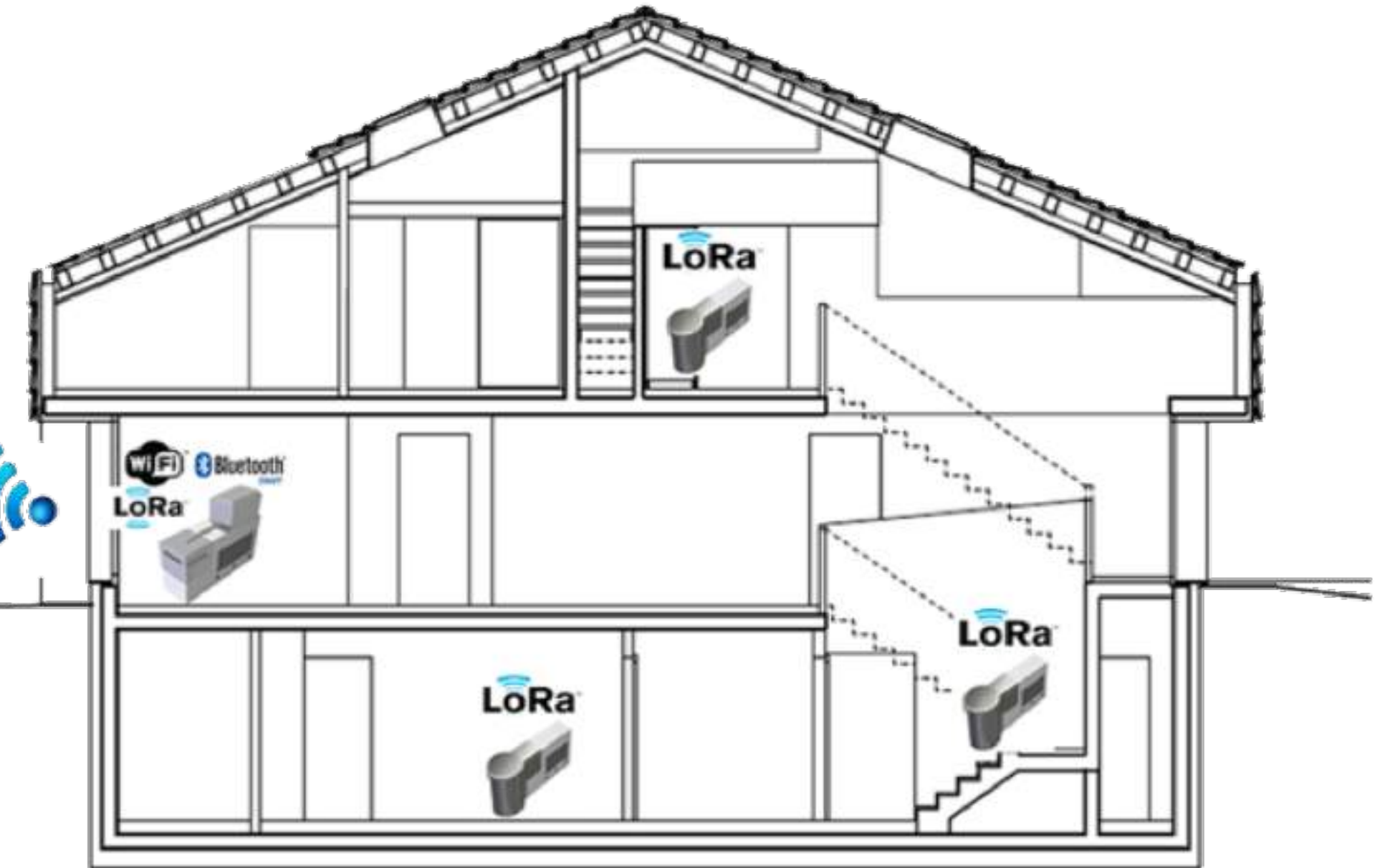
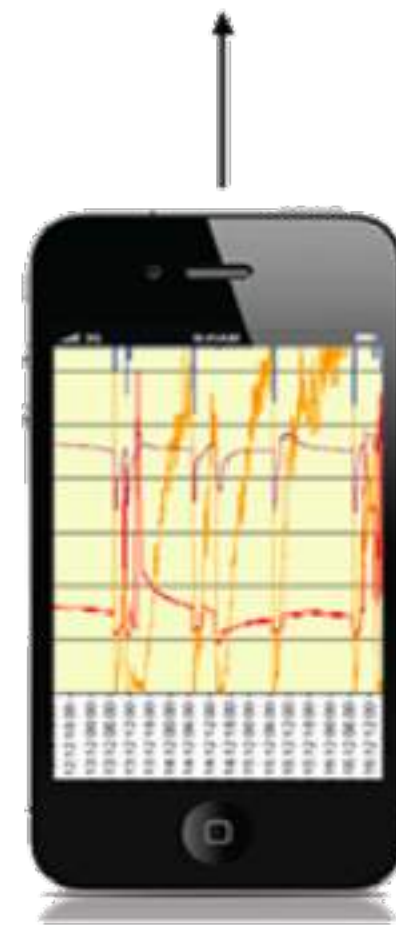
- 3D printed
- Small and Lightweight
- Embedded devices
- Battery powered



2 | REAL-TIME ANALYSIS

- Arduino as a microcontroller
- Cross platform to share radon data
- Open source platform
- Low cost
- Computer independent

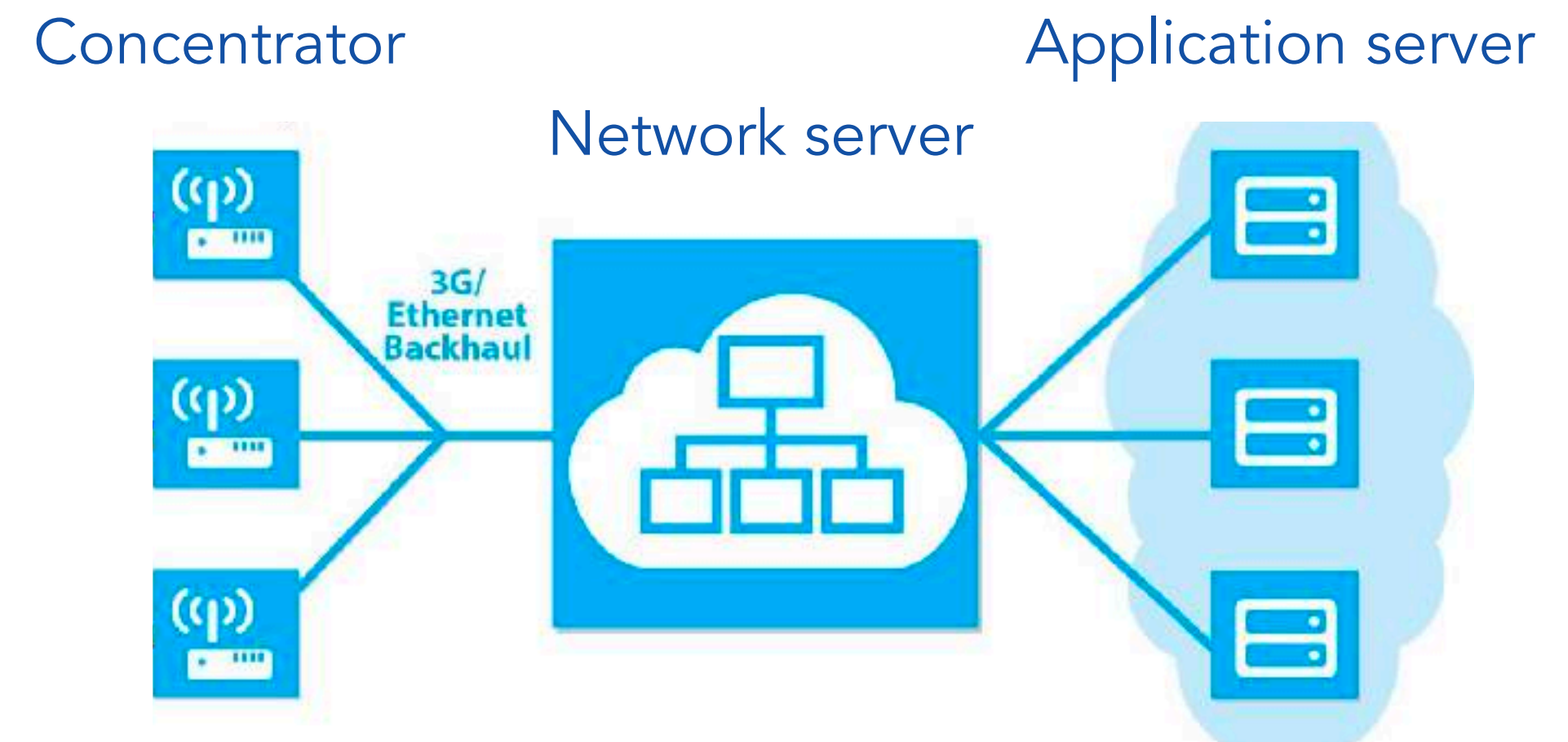
Radon data upload into national radon database



Real-time data available for analysis & immediate action

3 | CONNECTIVITY

- Long-range connectivity
- Low power, low bitrate, wireless telecommunications system



Swot / humanism

RaDoM PROJECT SWOT

- High technology in current market
(Accuracy / real-time data management /
Connectivity with other devices)
- Affordable price

S

- Approach for individual customer
(a little bit expensive for individual users)
- Country where isn't well known about radon
- Radon safe country
- Low awareness of radon risk

W

- High radon risk countries
(E.g. Japan / USA / U.K / Switzerland etc)
- Concerns of indoor air pollution
- Building regulations

O

- Privacy problem of data sharing
- Private user targeted radon detectors in market
- Competitive market

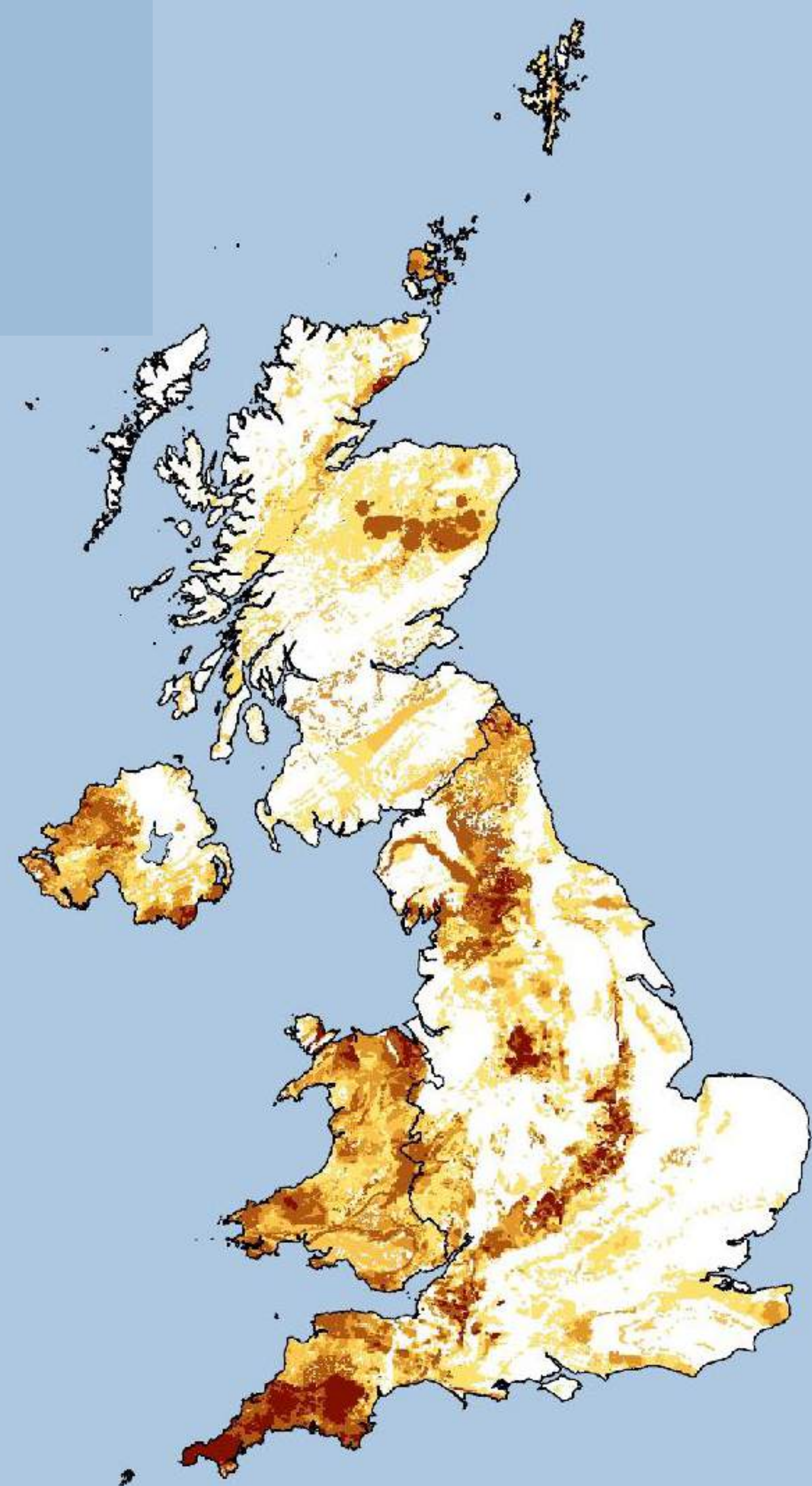
T

4 | TARGET USERS

POTENTIAL USERS CASE STUDY

Potential users have been identified as people who live in regions of the UK which have high levels of radon in the atmosphere.

A selection of people were interviewed from different places within these regions that have been highlighted as *'high risk areas'* to get a *feel for how this service can be useful for them.*





EXPERT INTERVIEW

“ People who stay in these areas may include School children & teachers ,Office workers ,Factory workers, Warehouse workers, Care home workers and patients , people who work or spend their time in large retail developments, Less able people that spend more time indoors — they are more exposed to danger of radon. ”

**— CHRIS SCIVYER,
Principal Consultant @Building Research Establishment**



A lack of awareness of radon danger



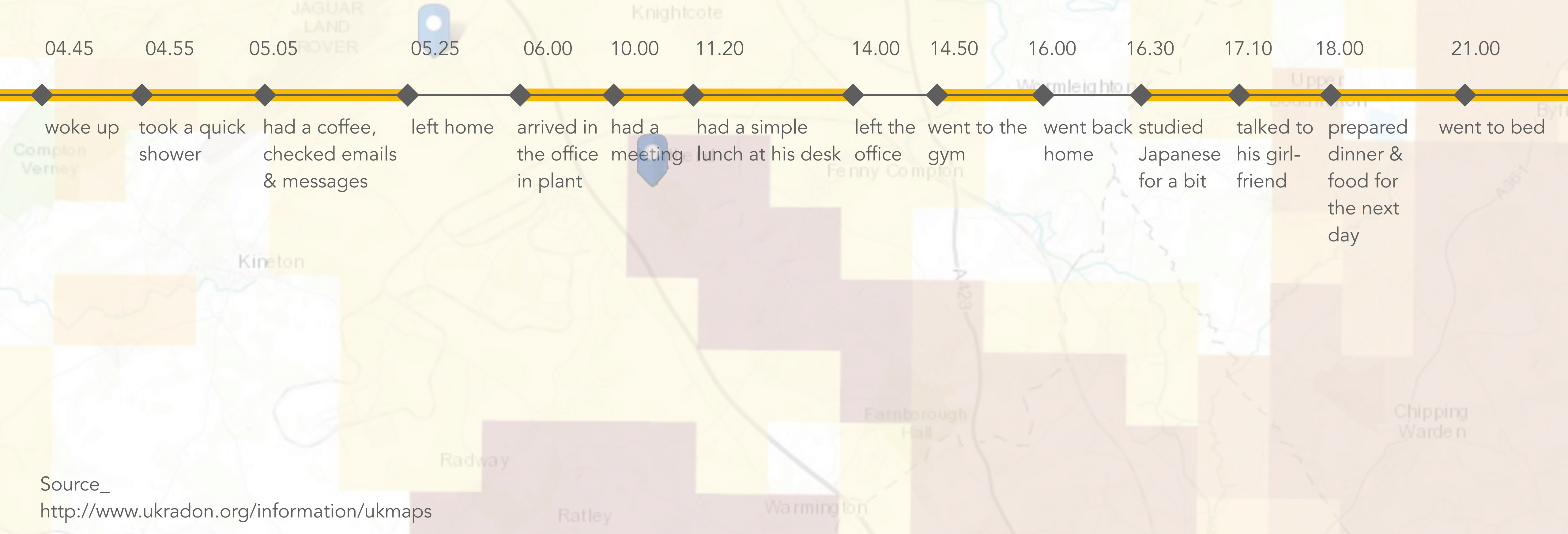
"I knew nothing about radon before this interview, but now I'm worried and will ask if my company has been tested, and how I can prevent radon problem?" - Max (25)

- Mechanical engineer for Jaguar Land Rover
- Lives with his girlfriend in the house they bought together
- Works in Gaydon, Warwickshire but lives in Leamington Spa; both have high levels of Radon
- Knows nothing about radon, feels scared after the interview



MAX'S DAY

don data





Require private sector monitoring



*“ I’m aware of radon in our home,
but I concern more about my children’s health in
school and make sure our children’s safety in
their class.” - Laura (42)*

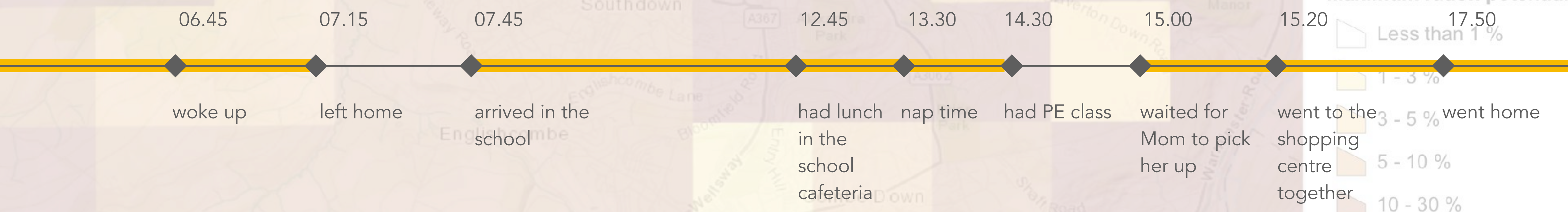
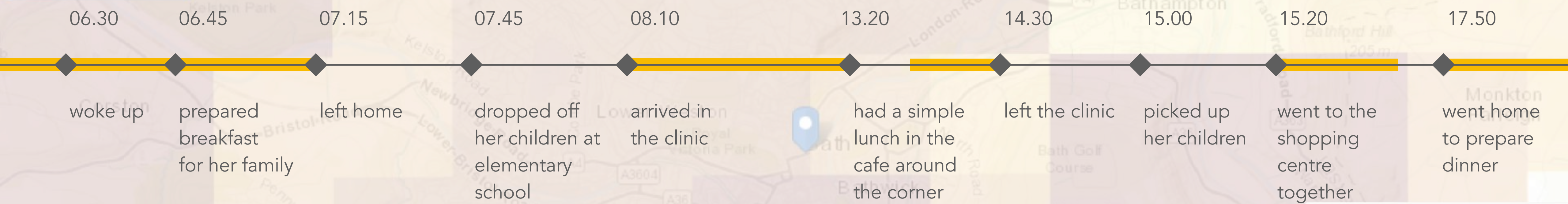
- GP
- Lives with her husband & 3 children in Bath
- Aware of radon, knows its links to lung cancer
- Had a radon test before buying the house they’re living now

Bath, Avon, England, GBR

LAURA'S DAY

ANNA'S DAY

Hide Radon data



Legend

Maximum radon potential

- Less than 1 %
- 1 - 3 %
- 3 - 5 %
- 5 - 10 %
- 10 - 30 %
- Greater than 30 %

Source_ <http://www.ukradon.org/information/ukmaps>

Close



A Lack of Action

“ I was sent some radon testing kits by the government 15 years ago; before that I never thought of testing it.” - Barry (72)

- Professor in University of Bath
- Lives with his wife
- Knows that Bath has significant level of radon
- Moved to Bradford on Avon 35 years ago
- Never thought to test his property for radon level, but being asked by local government to test his house



BARRY'S DAY

Hide Radon data

05.30 06.00 06.55 07.10 07.25 07.50 08.25 12.45 17.20 18.00 19.00 22.30

woke up
 went jogging in the park near by
 took a shower
 had a simple breakfast with his wife
 read the newspaper
 left home
 arrived in the lab in UOB
 had lunch in the school cafe
 left the lab
 did some gardenings In their lovely backyard
 had dinner with his wife
 went to bad



**RISK OF BEING
EXPOSED TO
RADON**

KEY INSIGHTS FROM USERS



High risk of exposure to radon

- People spend majority of their time at work/school & home



Lack of Awareness

- People either don't know about radon, or don't know the real risk
- People don't know if places they've been are tested



Lack of Action

- Currently acting passively
- Will test the radon level if they know the danger

PROJECT AIM

Using CERN's technology, the aim is to provide a *real-time radon data monitoring service* for the local government and private sectors in places with a high level of radon in the UK, to manage radon levels and *give awareness* to the public of how to take *preventive actions* for their safety and wellbeing.



FOR OUR QUALITY OF LIFE

5 | CONCEPT PROPOSAL

**Public
Radon
Announcement**



**Public
Radon
Announcement**

Predictable
Real-time
Accurate



**Public
Radon
Announcement**

SERVICE OVERVIEW



Hospitals

Shopping Centres

PRA

Public Radon Announcement

Local Government

Private Companies

Educational Institutions

SERVICE OVERVIEW



Hospitals

PRA

Public Radon Announcement

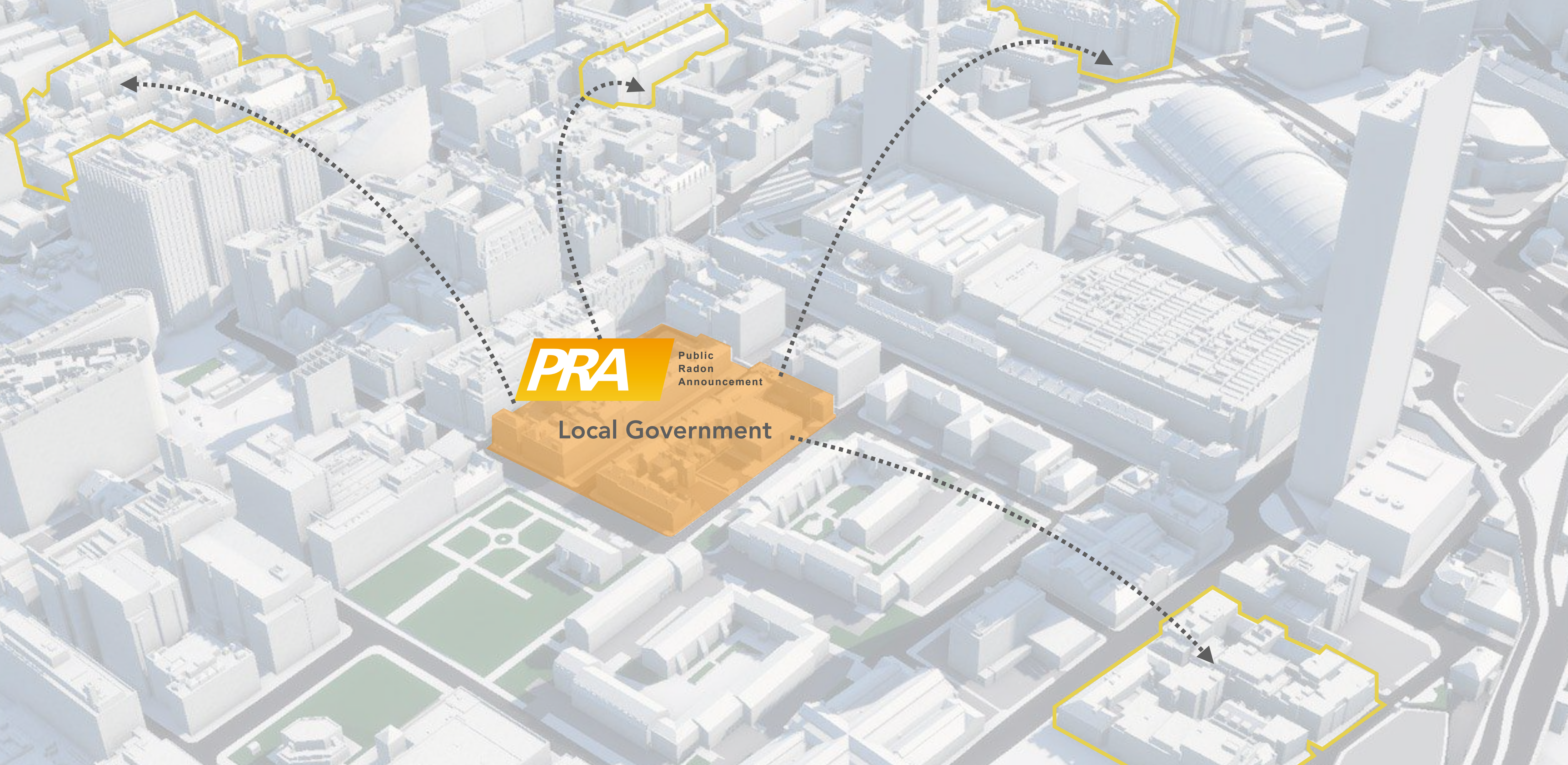
Local Government

Shopping Centres

Private Companies

Educational Institutions

SERVICE OVERVIEW



PRA

Public
Radon
Announcement

Local Government



FOR LOCAL GOVERNMENT

Real time radon level data monitoring



Predictable, Real-time, Accurate

Your building radon monitoring service.
Your chance to get involved.

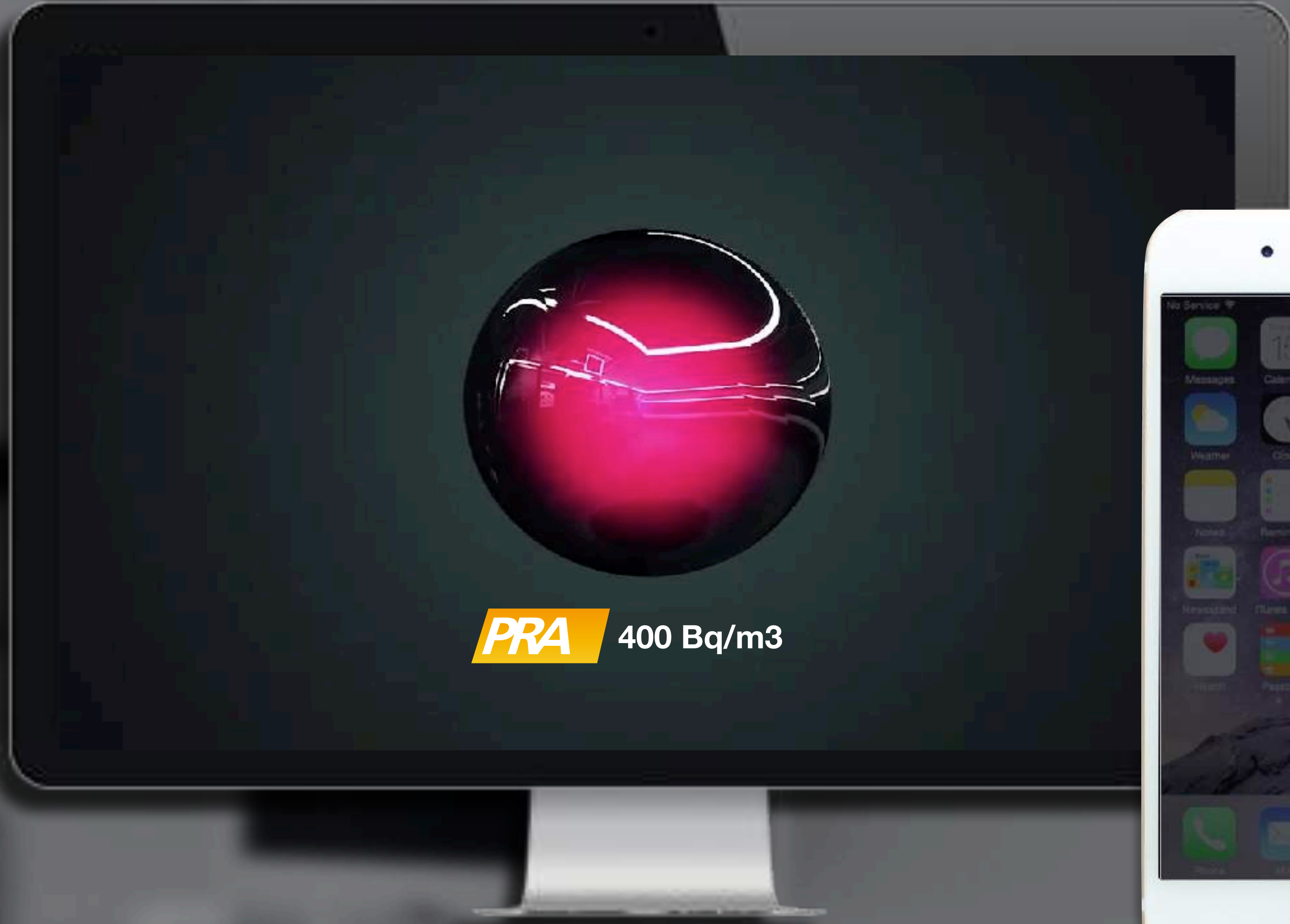
Summary document



-  **Important** - radon is a natural gas that is colorless, odorless and tasteless.
-  **Learn more** - visit [www.radon.gov.uk](#) for more information.
-  **Get involved** - find out how you can get involved in your building's radon monitoring service.









400 Bq/m³



Supply

Government business

Tech Suppliers



Kerlink

IMST



Sagemcom

Microchip Technology



3D modeling manufacturer

Telecom company



During service

Private sector

Educational institutions

Office

Factory

Warehouse

Care home

Large retail developments,

Airport

Ventilation company

After service

Individual house owner

Health insurance company

- Increase the profit
- Business to business
- Potential individual user

- Data on one platform
- Understand radon data flow
- Raise awareness of public
- Growth of local area



- Guarantee of safety to public
- Productivity of employees
- Customer loyalty

- Less risk of radon danger
- Reduce radon level
- Health and wellbeing
- Happiness and quality of life