
5G RuralDorset
Making Dorset a better place to live, work and visit
5G RuralDorset Legacy Workshop

INTRODUCTION

Executive Summary

The multi award winning 5G RuralDorset project has been researching ways to make rural and coastal regions better places to live, work and visit. This ground-breaking DCMS funded initiative, comprised of a multiskilled consortium of experts, has been pushing the boundaries of advanced connectivity since its inception. In January and February key project stakeholders and others from across Dorset came together for two workshops to consider the next steps following this successful project. This report presents the outcomes of these legacy workshops.

In the workshops use cases for 5G technology were prioritised under 4 areas: Health and Social Care, Agri-tech, Connected Coastline, Council Service Delivery. These are presented here with an outline of the development stage of each (e.g. pilot versus rollout) and of the infrastructure, stakeholders, and actions required to deliver them to the next stage. While each of these use cases can have an impact, the report argues that greater impact will be achieved by stacking use cases – leveraging the same underlying infrastructure for multiple use cases – and thus creating a far stronger business case.

The report outlines how these use cases might be stacked and provides a number of options for next steps ranging from extending the existing 5G RuralDorset project, to a wider local and regional roll-out or a more ambitions national rollout.

However it must be caveated that this report is based on the input of those who attended the workshop. Further research is needed and input sought from other stakeholders not represented to further validate the use cases, determine the most suitable sites for highest impact and return on investment, and define the technical requirements.

How to use this report

In anticipation that this report will have a number of different users across a spectrum of public to private sector, who may want to use it in different ways, it has been created as a PowerPoint deck with sections specific to different sectors. You are invited to extract the slides relevant to you and repurpose them to meet your requirements.

It is also important to keep in mind that whilst considerable work has been done to analyse and synthesise the outputs of the workshop on which this report is based, this workshop was conducted in two half day sessions, and as such not all topics could be explored in equal detail.

There is still considerable work to be done in order to move these ideas forward, but we hope that this document can provide a framework and direction for taking these next steps.

Contents

1. PROJECT CONTEXT

CONTEXT

The Aims of 5G RuralDorset:

- Contribute to the understanding of how 5G can be used to address challenges in public safety, economic growth, food production and environmental.
- Develop use cases that can be used as a blueprint for rural 5G.
- Support the UK 5G market to speed up its ability to serve challenging environments like rural Dorset.
- Create new opportunities in Dorset and rural communities across the UK.

Why Dorset?

- Connectivity is an issue. No motorways - makes digital even more important
- Lack of digital connectivity restricts the economy – productivity in rural Dorset is far lower than the UK average. Poor digital connectivity contributes an estimated £280m a year to this gap
- Demographic – Dorset has an older population. Social care spend more than half of Dorset Council's budget and there are pockets of deprivation in coastal areas
- Public safety – people from across the world enjoy the beautiful landscape in Dorset, but it can be dangerous
- Tourism is Dorset's biggest industry
- Dorset also provides a unique challenge having one of the UK's most protected landscapes (Jurassic Coast, UNESCO World Heritage Site).
- With these challenges Dorset can be seen as a blueprint for 5G roll out in rural areas – if it can be done in Dorset it can be done anywhere!

The Impact of the Covid Pandemic

5G RuralDorset began just before the outbreak of the Covid Pandemic when the digital divide became more evident and critical for those with poor or no connectivity (for example):

- Working from home
- Online medical appointments
- Online shopping
- Home schooling
- Tourism - Dorset experience a sharp increase in the number of visitors during the Covid pandemic, leading to:
  - An unexpected strain on local businesses, local communities and the council
  - An increase in incidents and accidents in the region putting even more pressure on the already stretched NHS and Emergency Services

PROJECT ACHIEVEMENTS

This project has delivered five 5G testbeds with diverse use cases which feed into studies showing how mobile connectivity can be deployed differently and more cost effectively in rural areas and which are scalable across other parts of the UK:

During implementation of these test beds 5G RuralDorset has:

Won 3 Connected Britain Awards

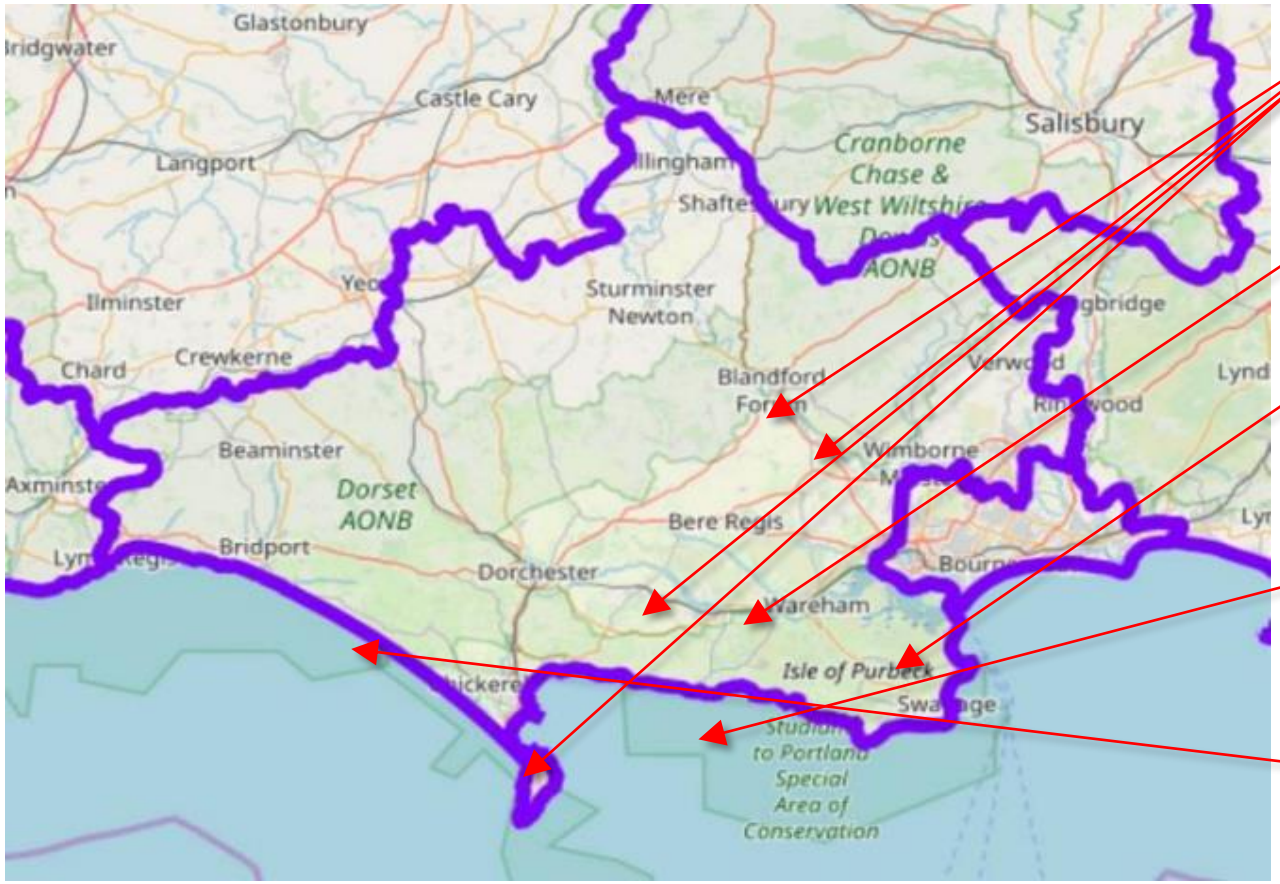
- Barrier Removal Award
- 5G Initiative Prize
- Sustainability Award

UK5G Awards 2022

- Best Collaborative Engagament

Achieved 3 'World Firsts'

- In-field 700MHz test
- Satellite Backhaul Test
- 5G buoy at sea



Future of Food
Wessex Internet masts in North and West Dorset

Innovation Accelerator
Dorset Innovation Park

Rural Community Accelerator
Worth Matravers

Connected Coast
Sections of Dorset coast

Coastal Cliff Monitoring
Burton Bradstock & Lyme Regis

2. THE LEGACY WORKSHOPS

THE WORKSHOP APPROACH

Following the success of the 5G RuralDorset project, these workshops were set up in order to plan out next steps through the identification of opportunities where enhanced connectivity could add value. These next steps ranged from further trials and testing of connectivity and services, roll-out of suitable applications across Dorset, and then further roll-out, regionally, and nationally. The intention was to create a set of recommendations and considerations for each of these scenarios, and an associated set of use cases that could drive expansion.

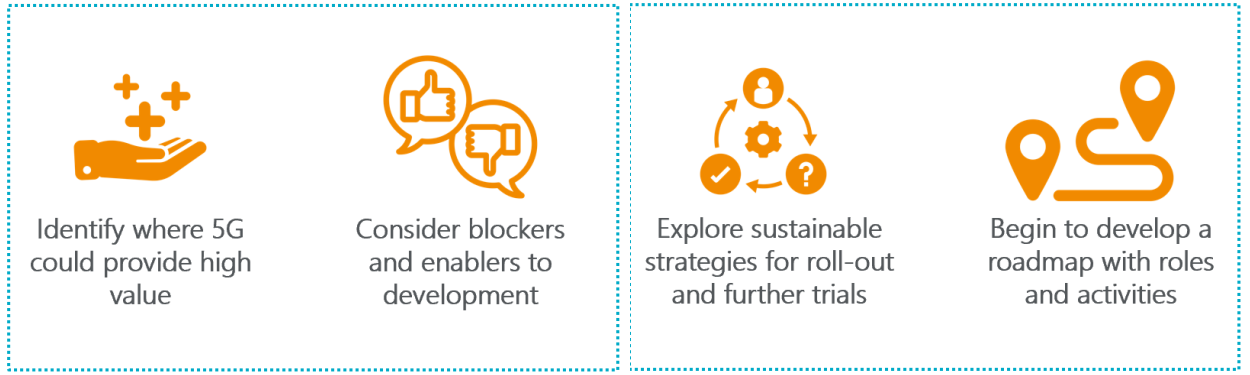
In order to better understand the range of suitable use cases, sectors that were identified as having a high potential value add from 5G were considered, and key stakeholders from these areas were invited to the workshop, from the local level up to the national. The areas identified were:

Health and Social Care
Agri-tech
Connected Coastline
Council Service Delivery

Through the initial project, each of these areas had shown potential for commercial value to be added, whether that was through cost reduction, revenue creation, or improved policy compliance. On top of the commercial value, there was high potential for social and environmental value too.

Initially the workshop was going to be run over a full day in-person. However, due to Covid restrictions at the time the decision was made to run the workshop virtually across two days.

The workshop used the following process in order to identify suitable recommendations for next steps:



Break-out groups were formed around each of the areas identified, and a virtual whiteboard tool called Miro was used, alongside video conferencing service Zoom, to enable the groups to work creatively and collaboratively through the different activities.

The Miro boards used can be found in the supporting documentation accompanying this report.

PARTICIPATING ORGANISATIONS

Health and Social Care

Dorset Council
Purbeck First Responders
Dorset CCG
South West Ambulance
Excelerate
5G RuralDorset
DCMS
Satellite Applications Catapult
Falmouth Uni

Agri Tech

Dorset Council
Wessex Internet
Defra
Harper Adams University
DCMS
Catapult
5G RuralDorset

Connected Coastline

RNLI
Atlas Elektronik UK
MoD
JET Engineering
Solent Maritime Enterprise Zone Head at Royal Navy
Excelerate
DCMS
Catapult
5G RuralDorset

Council Service Delivery

Dorset Council
Catapult
DCMS
5G RuralDorset

3.
5G TECHNOLOGY

5G TECHNOLOGY ECOSYSTEM

One of the key factors in the business case that underpins investment in rural 5G technology is the ability to leverage the same underlying infrastructure for multiple uses. As part of the exploration into different use cases that follows, it is useful to have a basic appreciation for the enabling components that make up a 5G ecosystem.

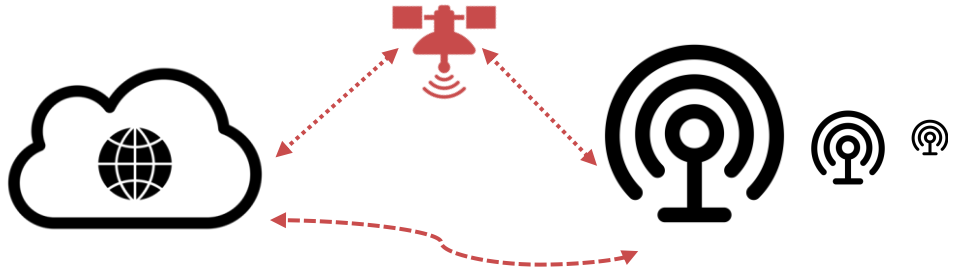
In this section a simplified overview is given as to the components of this ecosystem and the role each plays.

At the heart of a 5G network there are two elements, the **core network** and a number of **5G base stations.**

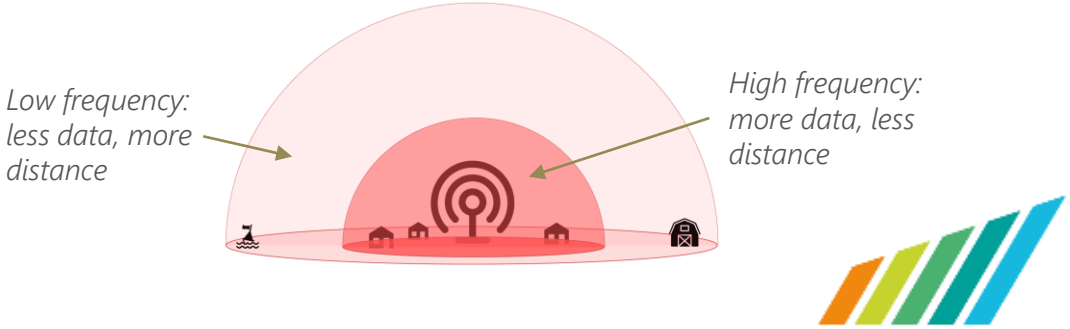
The **core network** authenticates users who connect to it, ensuring that they have credit, and managing delivery of services.

The **5G base stations** transmit the signal to which devices will connect in order to access the services that are run on the **core network**.

The core network and the 5G base stations may be located next to each other, or far away, but they need to be connected in some way for what is called 'backhaul'. This is often done with a cable, however, in order to create a resilient system, a satellite connection can be put in place for the backhaul. This means that in the event of some sort of natural disaster (such as a flood, storm, earthquake, etc) the connection between the base station and the core network is not lost and therefore devices continue to have connectivity.

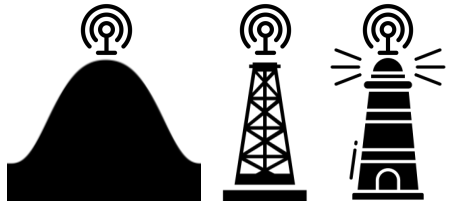


The 5G network runs on a range of higher and lower frequencies which the base stations generate. The higher frequencies allow more data to be sent, but over a shorter distance. The lower frequencies allow less data but can travel further.



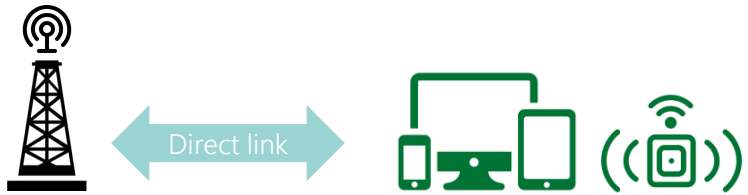
5G TECHNOLOGY ECOSYSTEM

In order to operate, base stations require power and are often raised up high to increase line of sight. This is traditionally done by putting a base station on a mast. However, base stations can be put on existing structures too, such as lighthouses, or alternatively set up on a naturally occurring high place such as a hill.



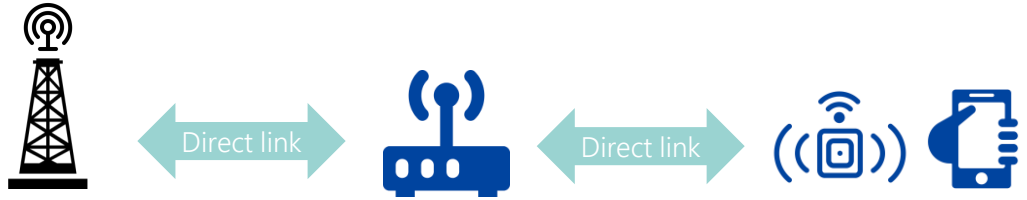
Once the base stations have been set up there are two ways that devices may connect to them. These depend on whether the device is '5G enabled' or not.

In the scenario where a device, such as a phone, laptop or sensor *is* 5G enabled, it can connect directly to the base station so long as it is within range.



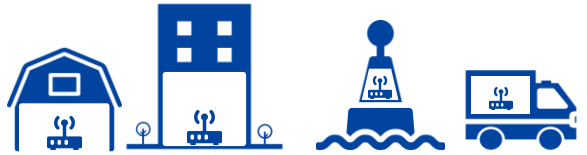
5G enabled devices connecting directly to the 5G base station.

In the scenario where devices are *not* 5G enabled, there is an intermediate step that is required in the form of a **5G router.** A 5G router connects to the base station and creates its own wifi signal which can be connected to by *any* wifi enabled device.



5G router enabling connection of non-5G enabled devices to the 5G network

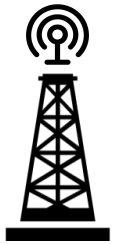
5G routers may be set up to be stationary, such as in a building, or mobile, such as on a vehicle or buoy. The position of the router will be dependent on the nature of the service being delivered.



5G TECHNOLOGY ECOSYSTEM
COMPONENT SUMMARY

The **core network** authenticates users and runs services

5G enabled devices, such as phones, laptops, and sensors, can connect directly to the base station



The **base station** generates the 5G signal for users to connect to

A **5G router** is used for devices that are *not* 5G enabled and creates a connectable wifi hotspot.

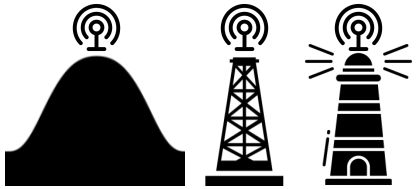
Satellites can be used for backhaul to increase network resilience

5G TECHNOLOGY ECOSYSTEM
STAKEHOLDER ROLES

In order for this ecosystem to operate, each of the component parts requires an owner/operator. The illustration below gives examples of which stakeholders might play which roles. Depending on the application and approach to 5G roll-out, different configurations may be more or less appropriate.

Network operators

Large Mobile Network Operator (MNO) or small MNO, satellite comms operator, private operator (e.g. council)



5G infrastructure owners

MNO, government, local council, other private entity (e.g. land-owner)

Service providers

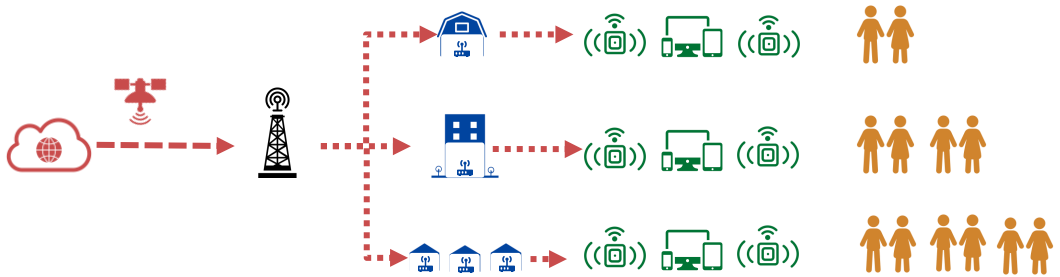
Government, local council, private entity (e.g. small business)

Customers & end users

This is explored in the next section of the report.

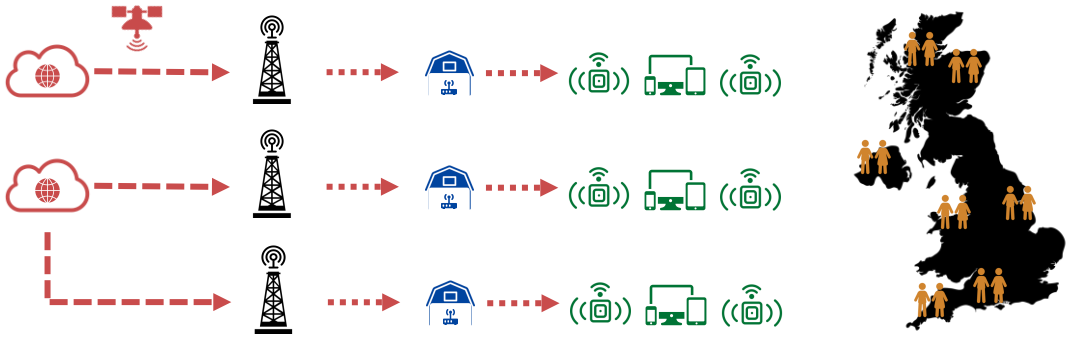
5G TECHNOLOGY ECOSYSTEM
COMMERCIAL CASE

As alluded to at the start of this section, a fundamental part of the underpinning business case for investment into 5G infrastructure is that one base station can enable a whole range of applications, which in turn create value that outweighs the cost of investment.



One base station enabling three different applications

Whilst the lack of existing infrastructure is a barrier to the development and delivery of 5G enabled applications and services, once the infrastructure is in place, the commercial case for service developers is significantly stronger, as they can leverage 5G infrastructure across the UK (and beyond) to reach a greater number of customers



One service able to be run on different 5G networks and reach more customers

The following section of this report explores use cases where applications could add value to sector specific stakeholders. The use cases were explored over the course of the workshop, and in some cases have been worked through in more detail than others.

The use cases were analysed based on the challenges they addressed, and the underpinning infrastructure required to deliver them. This was done in order to identify which use cases can be 'stacked' (delivered on the same infrastructure) in order to improve the commercial case for investment.


4. SECTORS
& USE CASES

4.1 Health & Social Care

4.1 Health and Social Care
Use Case Summary:

4.1.1
Health monitoring

Being able to reliably monitor patients will enable them to better manage their conditions and remain at home for longer, putting less demand on health & social care.

4.1.2
Connected health care enabling mobile working

When healthcare practitioners travel to a patient's home, being able to reliably access patient data and update this in real time means they are able to work more effectively and efficiently.

4.1.1 Health monitoring

4.1.1 Health Monitoring

How might we ensure reliable monitoring of patients at home or when they are out and about?

Opportunity

Being able to reliably monitor patients will enable them to better manage their conditions for longer, putting less demand on health & social care.

For example, for dementia patients this could mean remaining in their home for longer and helping family members to feel reassured that support is available when needed.

For diabetes patients this could provide them with the data they need to manage their condition and reduce the need for costly and time-consuming visits to healthcare services.

Scenario 1

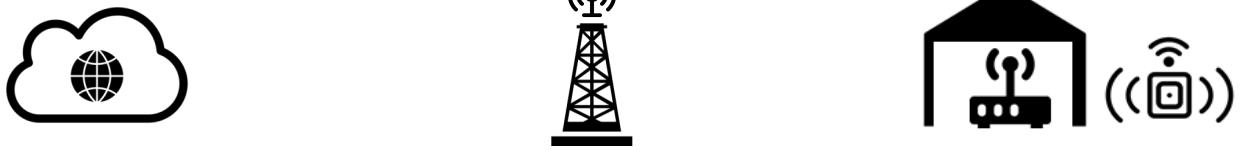
Dani has diabetes. She has been provided by her GP with a device to monitor her blood sugar levels helping her to manage her condition and prevent it from getting worse. Her GP is able to monitor her data and is alerted if there is any cause for alarm.

Scenario 2

Steve has dementia. His care provider has placed devices around his house to monitor for issues in the home such as the door being left open or cooker on. They also monitor his activity levels, sleep patterns and vital signs alerting healthcare practitioners to any concerns. They can then initiate a video call to check up on Steve and respond to his needs.

4.1.1 Health Monitoring

Infrastructure Requirement



Network Owner
Mobile Operator (NBIOT)

Infrastructure Owner
Mobile Operator (NBIOT)

Service Provider
IOT-SG delivering sensors and solution

Customer
- ICS / Local Council (included as part of support package)
- Potential for Hybrid model with private purchases made by individual or family member

Opportunity Drivers

- Residential care is the highest Adult Social Care cost to Dorset Council at £41.5m (budget)[2] costing up to £30,000 per person per year[1]
- Delaying entry into residential care can save money and result in better quality of life
- Community home care second biggest Adult Social Care cost for DC at £18.4m (budget)[2]
- 50% increase in new contacts with learning disabilities and mental health needing much higher and complex support
- Being able to reliably monitor dementia patients will enable them to stay in their homes longer putting less burden on health & social care. It will help family members to feel reassured that support is available when needed.
- Replacing just 5% of face-to-face GP appointments with telehealth video conferencing and real-time health monitoring would free up 1.1 million hours for GPs.[3]

Sources
1: Homecare Insight 2021
2: Dorset Council
3. O2 and Juniper research

4.1.1 Health Monitoring

Implementation Considerations

- Build on existing and proven NBIOT infrastructure already provided in Dorset.
- Encourage mobile operators to see value of NBIOT when applied across verticals.
- Service providers such as IOT-SG are already involved in this work but other providers would need to be encouraged. This could be done using targeted hackathons with SMEs.
- Bring council departments who would benefit together and explore how budgets could be ringfenced and resource pooled. Scope how this combined resource could work e.g. joint statement strategy, project team, staff to take the idea forward.
- Encourage adoption and trust in the technology amongst user communities by:
    - Showcasing multiple (smart place) use cases in one area allowing members of the public to see technology in use. Link up with other projects/organisations already doing this e.g. Wessex Digital Infrastructure Accelerator (DIA), Dorset CCG, Catapult Living Labs.
    - Creating web and video case studies
    - Developing expert users to share and cascade learning opportunities
    - Develop data sharing agreements

Key stakeholders

- Mobile Operators
- Device manufacturers and software houses
- Consumer
- Dorset CCG
- Dorset Council (Adult & Social Care)
- Carers / care providers

Next steps

- Engage with Dorset CCG to get their input on prioritisation of use cases and service design
- Engage with Wessex DIA and others to create places to showcase these technologies to end users and allow them to test them in order to build trust and raise confidence
- Scoping to understand what combined resource is needed to deliver this (from primary and health & social care)

4.1.2 Connected healthcare enabling mobile working

4.1.2 Connected healthcare enabling mobile working

How might we better coordinate a patient's care between different healthcare practitioners and allow data and information to be shared across practitioners/stakeholders?

Opportunity

When healthcare practitioners travel to a patient's home, being able to reliably access patient data and update this in real-time means they are able to work more effectively and efficiently.

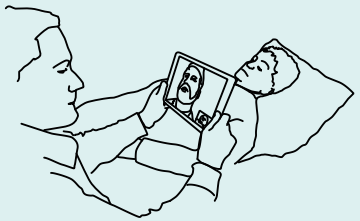
Furthermore, having access to reliable high quality video at the patient's home enables these mobile health workers to collaborate with other healthcare professionals in other locations allowing them all to see the patient, analyse the specific context and work together to provide tailored recommendations in an efficient way.

Scenario 1: Access to records

Lydia is an occupational therapist. When she arrives at a patient's home she is able to see all records for that patient and make timely decisions on their care. She is also able to update these records immediately saving her time and reducing her workload.

Scenario 2: Access to expertise on the go

Kit, a junior GP, is called out for an out-of-hours appointment. At the patient's home they realise they need more expertise to be able to decide the best course of action for the patient. They have a video call with another doctor who, on seeing the way the patient presents, is able to advise.



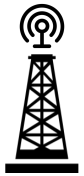
Scenario 3: Hospital at Home

Rashid looks after 'hospital-at-home' patients. Each patient's vitals are monitored by the hospital staff remotely and Rashid delivers interventions to them, such as intravenous treatments or point of care tests, when needed. Every day he holds a multi-disciplinary team meeting from the patient's home with other staff attending remotely via video and together they assess the patient's progress.

4.1.2 Connected healthcare enabling mobile working

Infrastructure Requirement

Network Owner
Mobile/Non-Terrestrial or Private Operator



Infrastructure Owner
Mobile/Non-Terrestrial or Private/Public Operator

Service Provider Options
a) Vehicular connectivity solution (router)
b) Portable solution
c) Wide Area Network (LTE and/or Satellite) direct to device

Customer
Healthcare trusts / CCG / Council

Opportunity Drivers

- Community home care second biggest Adult Social Care cost for Dorset Council at £18.4m (budget)[1]
- Poor connectivity cited as biggest challenge to effective mobile working by community nurses in patient's homes[2]
- Staff recruitment is a huge challenge to social care. Technology and connectivity can help people work smarter
- Efficient use of staff travel, increased staff wellbeing, reduced cost and emissions
- Hospital stay is approx. £200 – 300 per day per patient[3]. Hospital at home eliminates 'hotel' component of hospital stay
- 320% (£7.2m) hospital social work increase for DC since start of COVID-19
- No 'visiting hours' restrictions – better outcome for patient
- Reduced waiting list. Currently 45% of patients in Dorset County Hospital NHS trust are waiting over 18 weeks to start treatment.[4]

Key stakeholders

- Operator e.g. Vodafone, OneWeb
- Device manufacturers and software houses e.g. Pepwave, Livewire
- Dorset CCG / ICS
- Dorset Local Authority (Adult & Social Care)
- Carers / care providers

Source
1: Dorset Council
2. The Queen's Nursing Institute 2018
3. University Hospitals Birmingham 2019
4. NHS England and NHS Improvement: monthly RTT data

4.1 Health and Social Care
Use Case Readiness:

These use cases were identified as being at the following stages of rollout:

PILOT STAGE
For early-stage concepts

FURTHER TRIALS NEEDED
to develop service

READY FOR ROLL-OUT
Following successful trials

4.1.1 Connected healthcare enabling mobile working

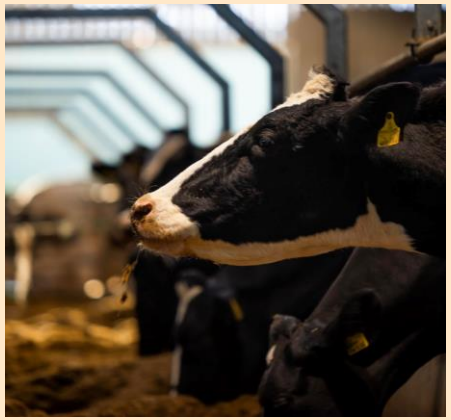
A pilot partnering with healthcare practitioners to develop the service design will be key for adoption and progression.

4.1.2 Health monitoring

The NBIOT technology needed for this was validated during the previous phase and can be built upon for further rollout. Adoption needs to be encouraged by creating places to showcase the technologies and allow end users to engage with them and build trust.


Agri-tech

4.2 Agri Tech
Use Case Summary:



4.2.1 Remote Monitoring of Cattle

Automated detection of cattle lameness at an early stage can help to reduce both the cost of treatment and prevent further spread of infection throughout the herd. This is great for animal welfare and higher productivity

4.2.2 Autonomous Farm Operations

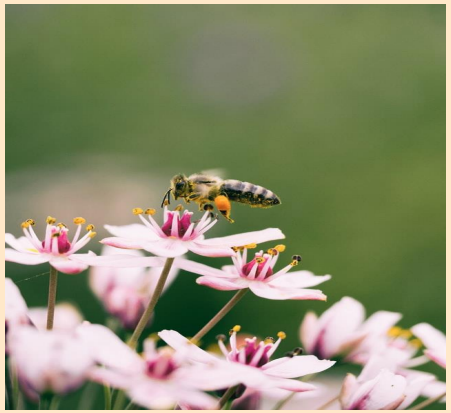
Agri robots can improve efficiency and productivity in agriculture and help to address some of the issues faced by farmers. They can also reduce environmental impact.

4.2.3 Pollution Warning for Aquaculture

Combined Sewer Overflows (CSO) into the sea can cause losses to aquaculture businesses. Early warning of the CSO and its location can help trigger a timely mitigation to minimize losses

4.2.4 Lone Worker Safety

Use of personal technology to ensure that those working alone or at unsociable hours can be monitored and an alert issued in the event of injury



4.2.5 Environmental and Pollution Monitoring

Sensors to detect changes in the concentration of pollutants in air or water and deliver frequent and regular data around the presence of specific pollutants

4.2.1 Remote monitoring of cattle

4.2.1 Remote monitoring of cattle

How might we improve the welfare of cattle while reducing the cost of illness?

Opportunity

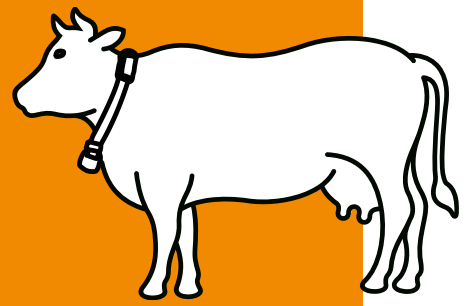
Monitoring of dairy cattle with the aim of early diagnosis of lameness (and potentially other conditions and livestock) to deliver early remedy thereby avoiding the issues and costs of extended periods of illness for individual animals as well as helping to stop the problem before it spreads throughout the herd.

Opportunity Drivers

- Lameness in cattle affects 10% of herds on average can cause:
  - Increased risk of premature culling
  - Reduced fertility
  - Reduced milk yield
- To a farmer with a herd of 200, there is a potential saving of £14,000 in identifying lameness early
- Across the SW of the UK where there are almost 430,000 cows that could equate to a £30m saving
- Opportunities also to extend the technology to sheep, etc

Scenario

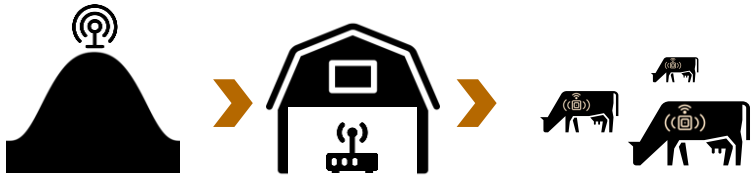
A cow contracts an infection that leads to lameness. Technology monitoring the herd identifies the problem before the farmer. They are alerted to the issue enabling them to seek immediate medication thereby avoiding the long-term cost of lameness in that animal, improving animal welfare and preventing the infection from spreading to the other animals in the herd.



4.2.1 Remote monitoring of cattle

Infrastructure requirement

Low throughput network (IoT) with 5G enabled sensors



Inclusion of a router if sensors are not 5G enabled.

Key stakeholders

- Farmer
- Network operator (MNO, Satellite comms provider, Private operator, Neutral Host)
- Landowners (for connectivity infrastructure)
- Platform operator/supplier
- Tag supplier

Implementation considerations

Farmer resistance to adopt technology:

- Make sure that the ownership and use of data is clearly stated and will not disadvantage the farmer

Next steps

- Demonstrate existing solutions and those that are close to market
- Explore how a Living Lab could help develop the product/service in a realistic environment and present benefits to end users
- Use products that require either minimal capacity connectivity or where data can be uploaded from reader later
- Explore potential for insurance company involvement

Source: AHDB 2020

4.2.2 Autonomous farm operations

4.2.2 Autonomous farm operations

How might we drive productivity through the sustainable intensification of agriculture while reducing environmental impact?

Opportunity

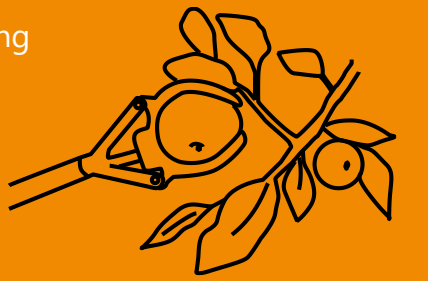
Private on-farm 5G network enabling a combination of crop-picking robots to work alongside humans as well as agri-vehicles capable of conducting precision agriculture operations

Drivers

- Improving productivity by minimising farm inputs, such as water and pesticides, while increasing yield
- Agri-robots urgently required by industry due to COVID-19 and Brexit impacts restricting access to labour
- Reducing environmental impact through reducing chemical use, soil compaction, water use, etc
- Improved continuous monitoring enables rapid reaction to environmental conditions
- Efficiency and productivity increases are imperative across the entire supply chain for economic reasons
- Modern farm machinery and rural telecommunications infrastructure limit access to modern data-backed agri approaches and applications

Scenario 1

Shortage of farm labour leads to a risk of fruit spoiling before it can be harvested. Robotic fruit picker can identify and pick individual fruit at the optimum ripeness for harvesting, ensuring that waste is minimised and productivity increased. Greenhouse conditions are optimised for fruit growing without needing to consider human comfort

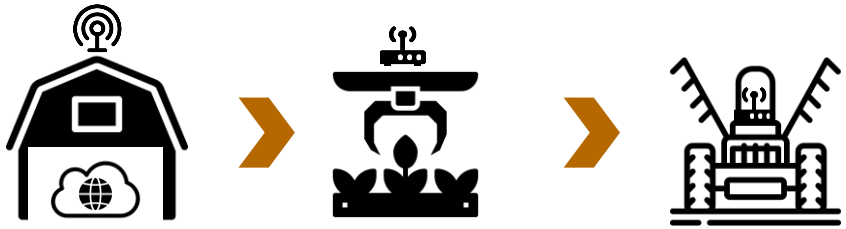


Scenario 2

Precision farming and automated tractors can reduce pesticide and water use, improving productivity while reducing soil compaction and pollution. Soil sensors along with crop monitoring can help the farmer ensure that conditions are optimised for maximum crop health

4.2.2 Autonomous farm operations

Infrastructure requirement



Private network hosted on site

5G enabled robotics and autonomous vehicles across a farm

Key stakeholders

- Farmers
- Technology developers and the supply chain including integrators
- Applications specialists – translate end user needs into development requirements
- Connectivity provider (MNO/NH)
- Funding source
- Industry 'influencers'
- Property owners (for infrastructure)
- Product/service developers

Implementation considerations

- High cost and risk of adoption (end users)
- Recent offerings have not been fit for purpose
- Cultural resistance "if it ain't broke, don't fix it"
- MNOs won't allow some tech to be used on their network
- Legislative issues
- Spectrum licensing
- Infrastructure cost

Next steps

- Assess greatest need from currently available products/services
- Is further development needed?
- Assess connectivity needs
- Find most suitable location (minimum investment)
- Pilot/test/develop
- Address affordability (business models?)

Source: AHDB 2020

4.2.3 Aquaculture farms

4.2.3 Aquaculture farms

How might we gain advance warning of pollution events caused by Combined Sewage Overflows (CSO) to enable timely mitigation and reduction of losses?

Opportunity

Networked sensors at each CSO site, along with understanding of water currents, to predict which beds are likely to be affected and when. Software/app/API to provide immediate warning via text/email/app.

Drivers

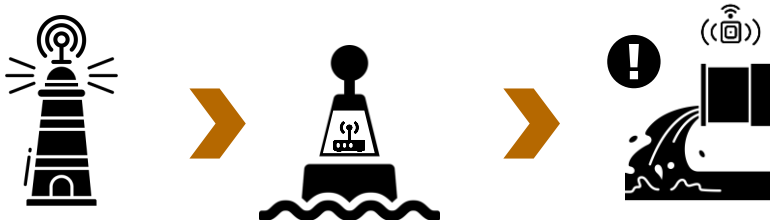
- Aquaculture farms are extremely sensitive to pollutants, and waste water from sewage overflows can carry diseases that can be transferred to produce
- Example analysis in Poole Harbour showed a potential saving of at least £21k a year through alert enabled mitigation to oysters alone
- Aquaculture in Dorset – high potential opportunity
- Business case being developed for national Aquaculture Centre of Excellence

Scenario

Pollution resulting from a Combined Sewage Overflow (CSO) after heavy rain can infect farmed shellfish or seaweed with norovirus, inflicting losses on the farmer and potentially cause illness if the produce subsequently enters the food chain. An early warning system would enable the aquaculture farmer to mitigate losses if received as soon as the CSO takes place and could highlight the probability of individual farms being affected if ocean currents are modelled.

4.2.3 Aquaculture farms

Infrastructure requirement



Low throughput network (IoT)

IoT sensors allow for early warning in case of water pollution

Key stakeholders

- English Aquaculture Innovation Hub
- Bangor University (ocean current study)
- Sensor operator
- System owner (data processing and issuing warnings to users)
- Aquaculturists
- Software developers

Implementation considerations

- Cost – aquaculture farmers unlikely to pay for the system (who will?)
- Data privacy – concern over data being owned by others and potentially used against the intended beneficiaries
- Scepticism: previous technology used in the industry has failed quickly
- Connectivity

Next steps

- Review the Bangor University research report
- Model passage of overflows e.g. dispersion, route (which farms will be affected), duration of effect, etc.
- Ability of end users to use the information provided
- Intermediary to mount and monitor sensors, analyse the results and generate pollution warnings
- This is an early-stage project needing basic research

4.2.4 Lone Worker Protection

4.2.4 Lone worker protection

How might we ensure that those working remotely or at night are safe?

Opportunity

Personal connected devices that can automatically alert others if an individual gets into trouble, enabling instant location and potentially communication even when the individual may not be able to activate it.

Drivers

- Farm workers often work alone with machinery or large animals resulting in a potentially hazardous environment
- In 2020/21 some causes of death for farming, forestry and fishing workers were:
    - 6 by contact with machinery
    - 11 when injured by an animal
    - 41 total deaths

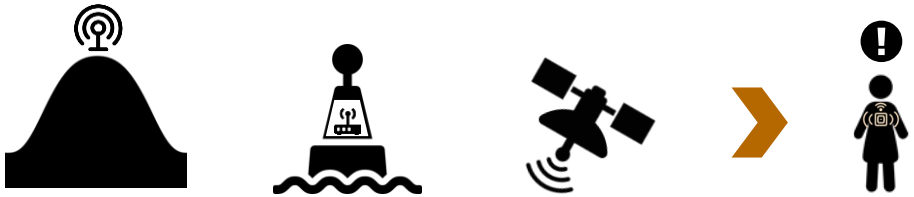
If working alone when injured an alert could be life-saving

Scenario

Workers operating alone in remote areas may be unable to call for help either because of lack of cellular connectivity or injury in the event of illness or accident. A technological solution would automatically generate an alert, with location, regardless of cellular connectivity or the individual's capacity to operate the equipment.

4.2.4 Lone worker protection

Infrastructure requirement



Low throughput network (IoT)

Personal wearable device issues automated alert, including location, if a lone worker gets into difficulty

Key stakeholders

- Farmers
- Aquaculturists
- Infrastructure operators for connectivity
- Technology, product and service developers
- Rescuers

Implementation Considerations

- Technology that can distinguish injury from normal farm activity (e.g. fall detection)
- Connectivity

Next steps

- Scout for technologies available and under development
    - EPIRB operating via satellite is already available for marine workers
- Investigate connectivity needs

4.2.5 Environmental Protection

check image rights

4.2.5 Environmental monitoring

How might we monitor water quality in a way that exceedances are notified in a timely manner and obtain frequent measurements of specific pollutants?

Opportunity

Use of networked sensors to detect water pollution and provide continuous monitoring enabling analysis and time-of-day / week / month interventions to be put in place. Same sensor network can be used for verification of intervention.

Drivers

- Restrictions are placed on organic fertilizer application to ensure that it does not give rise to diffuse pollution
- Approximately 58% of the land in England is designated a Nitrate Vulnerable Zone (NVZ)
- 47% because rivers breach the 50mg/l limit
- 25% because ground water breaches the 50mg/l limit
- Defra reviews NVZs every 4 years to account for changes in water pollution

Scenario

Nitrate pollution from agriculture finds its way into water courses creating Nitrate Vulnerable Zones (NVZ) which affect about 58% of the land in England. The use of sensors in water courses would provide constant monitoring and enable early detection and intervention of pollution events.

4.2.5 Environmental monitoring

Infrastructure requirement

Low throughput network (IoT)

IoT sensors allow for early warning in case of water quality events

Key stakeholders

- Environment Agency/Defra
- Dorset Council
- Farmers & aquaculturists

Blockers and strategy for success

- Reducing pollution could impose additional costs on farmers
- Water monitoring would need to be carried out in multiple locations to determine the point of entry
- This is not covered by ELMS legislation
    - Pilot scheme uses video call and is testing remote monitoring but not IoT
    - Additional supporting evidence is not mandatory in most cases
    - No indication that this will change when scheme is implemented

Next steps

- Work with Environment Agency to discover scope and usefulness of the project.
- Study to identify where monitoring would yield the biggest result
- Identify funding sources and stakeholders

4.2 Agri-tech
Use Case Readiness:

These use cases were identified as being at the following stages of rollout:

PILOT STAGE
For early-stage concepts

FURTHER TRIALS NEEDED
to develop service

READY FOR ROLL-OUT
Following successful trials

4.2.3 Autonomous Farm Operations
Some technology in common use (e.g., self steering tractors).
Multiple technologies in development.
Further development and product/service development needed along with much better connectivity.

4.2.4 Lone Worker Protection
Devices/network/service development needed.
Some commercial systems do exist as apps etc.

4.2.1 Remote Monitoring: Cattle
Much of the technology and some services appear to already be available to implement this.
Can be delivered via domestic broadband or potentially through IoT infrastructure (needs to be assessed)

4.2.2 Aquaculture Farms
Network and potentially sensors exist – must be durable.
Ocean current study needed (Bangor Uni.)
Integration, software development, software, study of effects and mitigation measures etc needed.

4.2.5 Environmental Monitoring
IoT network should be enabled for sensors.
Sensors need to be more durable.
System development needed.
Liaise with user – Environment Agency for usefulness


Connected
Coastline

4.3 Connected Coastline
Use Case Summary:

4.3.1 Utilising existing structures for base stations

With further 5G base stations core to widening the reach and impact, here we have explored how implementation costs might be reduced through exploiting existing infrastructure.

4.3.2 Connectivity for watercraft

Among the many potential beneficiaries for reliable and enhanced connectivity along the coast, here we have explored the most active port users at present. Those best suited to 5G adoption and long-term investment have been focused on.

4.3.3 Location based information

Expanding the successful connected signage trials, here we have generated further ideas for utilisation and public engagement. Potential revenue generation through proximity advertising and the value of live data to local businesses were also explored.

4.3.4 Maritime IoT

Realtime data on assets and environments enables informed decision making and realises significant cost saving through streamlined processes. The 5G network unlocks many currently unreachable areas to a wide range of audiences, a few key sectors are explored here.

4.3.1 Utilising existing structures for base stations

4.3.1 Utilising existing structures for base stations

How might we reduce rollout costs by making use of present infrastructure?

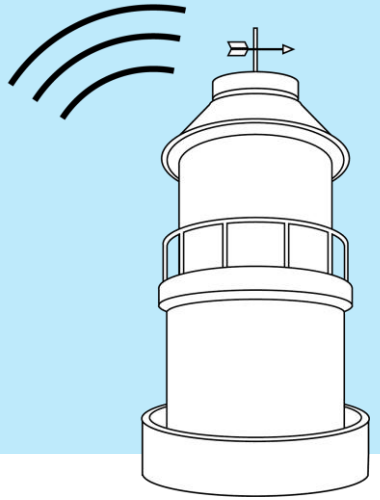
Setting up a new base station requires high investment for kit, power and supporting infrastructure. This can range from around £300k-£500k for a standard site. Setting up a coastline or offshore base station comes with significant added complexity and therefore significant added cost.

Opportunity

Utilising existing coastal and offshore assets such as lighthouses, windfarms and rigs, which are already built and powered, offers the opportunity to save time, money and optimise the use of present infrastructure.
The reach of the base stations can then be further extended by continued rollout and deployment of 5G-enabled buoys.

Example Scenario

Anvil Point Lighthouse were keen to utilise their prime position to extend their protection of people at land and sea. Within a week, the implementation team were able to retrofit the necessary hardware onto the lighthouse and connect to the core network. Now fully equipped as a 5G base station, the coastguard and RNLI have constant connectivity on rescue missions, when operating around the coast.



4.3.1 Utilising existing structures for base stations

Implementation Considerations

The 5G base stations underpin all the other applications and so further installations are fundamental to realising the other opportunities shared. Once installed, the base station will be able to connect to the network and transmit the 5G signal to a given range. The technology and system design has been proven through the previous trial, though we are mindful that there may need to be small adaptations to retrofit onto what's at the site. Maintaining the relationship with trial delivery partners for component sourcing and base station set up would reduce risk through existing system familiarity and network continuity.

Next steps

- Identify assets across the coastline/offshore that are of sound structure and are powered. Those that are best located based on existing 5G base station range and scale of users should be seen as priority sites. If a key structure is privately owned, permission from the asset owner should be sort as soon as possible.
- OFCOM will need to approve a commercial licence to operate, it is advised that the plan for the whole network is shared at this time.
- Orders for components and an installation team will need to be made once a timeline has been agreed.

4.3.2 Offshore connectivity for watercraft

4.3.2 Offshore connectivity for watercraft

How might constant, reliable connection across the complete Dorset coastline enable significant safety and economic benefits?

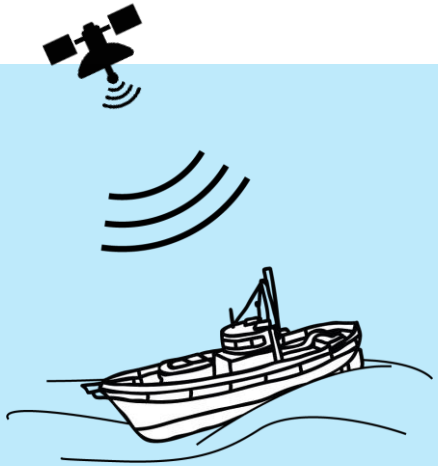
Coastal and maritime communities currently experience widespread 'blackspots' where a network connection cannot be found due to the current technology being limited by range and line-of-sight. This is a problem for operation, navigation and safety.

Opportunity

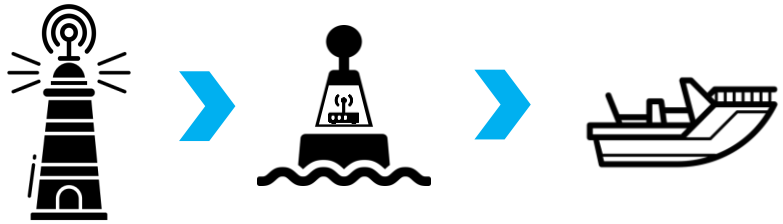
The rollout of more off-shore 5G base stations will offer reliable offshore connectivity. This will be of particular interest to commercial and private watercraft, while also extending the range of connection for rescue services. Such ubiquitous connectivity will enable sharing and receiving of mission critical information, while making the Dorset coastline a more attractive offering for leisure vessels.

Example Scenario

The Piscateers are an independent company fishing off the Weymouth and Portland coastline. Safety has always been a concern to Alex and Sam. Previously, if they or the boat are in trouble, the lack of phone or radio signal would put them in a very vulnerable position and possibly unable to call for help. The 5G network gives assurance that if help is needed, they will always be able to call.



Infrastructure requirement



Coastline/offshore 5G base station. The reach of the base stations can then be further extended by continued rollout and deployment of 5G-enabled buoys.

Serving maritime assets with 5G routes or receivers

4.3.2 Offshore connectivity for watercraft

Opportunity drivers

- Approximately 50% of those accidentally drowned are dead before first responders know they are in trouble.[1] Reliable connectivity would ensure an emergency call is possible wherever an incident occurs, and so it is hoped that this will help reduce preventable fatalities.
- The UK government calculates the value of a 'Prevented Fatality' to be £1.6m (2010 £ equivalent)[2], accounting for that individual's contribution to the national economy both directly and indirectly.
- Offshore connectivity would put the Dorset coastline at a significant competitive advantage to other boat tourism locations across the UK. Based on the annual revenue statistics, every 1% increase in boat-based visitors to the region has the potential to realise a further £100k for businesses across Dorset.[3]

Key stakeholders

Support from largest users of Portland harbour will be of significant value through the trial phase and ongoing success. Such a market push would help illustrate the business case to potential investors.

Engagement with authorities, infrastructure and regulatory bodies (e.g. the port authority, MNOs and OFCOM) will be key for implementation, cooperation and alignment in priorities.

The MNOs (Mobile Network Operators) may also be most suited to taking ownership of the trial infrastructure, together with the necessary expansion of new base stations. The challenge is whether they will realise a large enough return for the investment and maintenance costs.

Source
1: Project participant
2: gov.uk July 2020
3: Dorset Council 2020 tourism

4.3.2 Offshore connectivity for watercraft

Implementation Considerations

The 5G infrastructure at Portland Port should be utilised to prove profitable and sustainable applications. Understanding existing operators and operations already within Portland Port is essential to identify those that could have the funds and interest for network ownership.

Individual use cases in themselves are unlikely to provide enough demand to justify the investment. The accumulation of demand through stackable use cases may generate the volume, however it will require multiplying the resource & effort. Target use cases with larger, influential groups with money to spend.

Portland port is one of only three sites in the UK authorised to accommodate nuclear submarines. Might it be in the interest of public safety to have reliable and fast means for communication and information dissemination?

Moreover, it is worth noting that Portland Harbour hosted the 2012 Olympic sailing events, with Weymouth and Portland National Sailing Academy at Osprey Quay benefitting from significant investment. It continues to be a key UK site, home to many users, clubs and events throughout the year. Race days see an influx of visitors and service providers, where the latter may bring seasonal requirement for reliable connection. For example, onboard tracking, live video feed and safety devices. Though potentially lucrative, would this fluctuating demand provide enough revenue to be sustained through low seasons? Would enhanced connectivity have enough draw to bring further events and trade, and how could this be calculated?

Next steps

Review of those who have benefitted most from the 5G trial and thus would miss it the most if 'switched off' at the end of the trial phase? These parties should be engaged as either a potential network owner, or as committed end users to potential owners.

With Portland Port identified as the ideal trial site, the suggested actions are below:

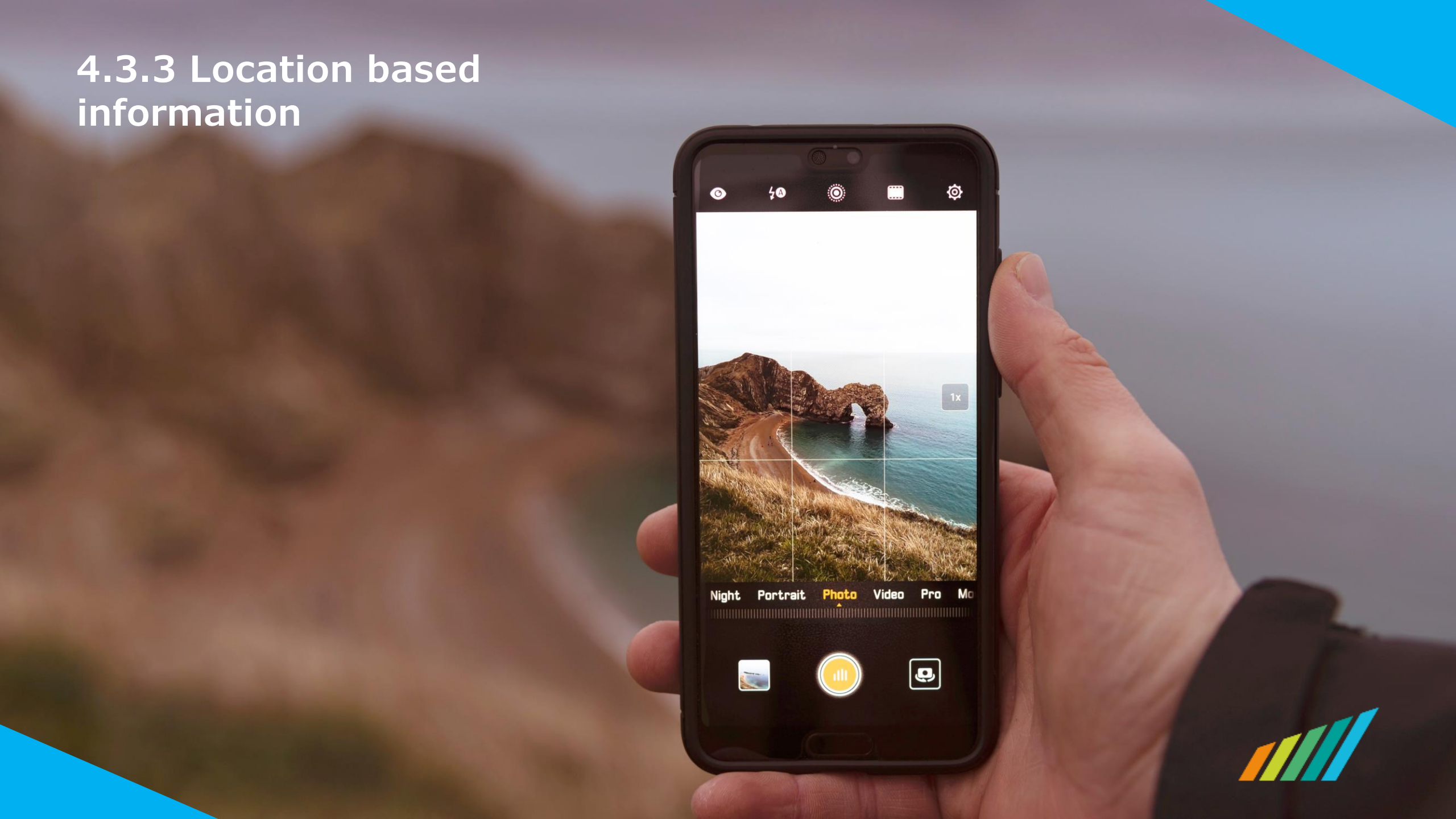
User engagement:

- The first trials would be best carried out with a commercial operator that owns several vessels operating in and around Portland Harbour.
- Once this trial group is selected and engaged, the service should be co-designed with those that will end users
- Capture any challenges experienced through the trial, following an iterative improvement cycle.

Data & platform:

- Need to get commitment for long-term network ownership, whether from a large mobile network operator or otherwise.
- The delivery model, specifically around service provision requires development, exploring whether each user group is best served through the same or adapted portal or by distinct providers.

4.3.3 Location based information



4.3.3 Location based information

How might we provide visitors with real-time and location based information that increases their safety, enhances their stay and benefits the local economy?

Opportunity

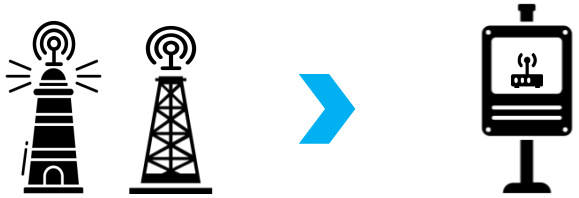
Further rollout of the coastal connected signage would expand the impact through the communication of specific, location based safety notices so that visitors are equipped with knowledge to avoid hazards.

Example Scenario

Visitor numbers can reach unsafe levels in peak seasons, yet it is hard to monitor, regulate or advise as it's a constantly changing metric. Most visitors are unlikely to hold 'local knowledge' that allows for alternative choices of location or facilities, and such circumstances lead to blocked roads, unnecessary travel and compromised safety.

Live visitor numbers would enable automatic car park closures and redirection of traffic (potentially to other attractions) when a given, safe level is exceeded. This would enable staff to be re-deployed and potentially eliminate the need for police intervention. Or collaboration with navigation apps could notify visitor en-route that the car park is closed and suggest alternative before arriving.

Infrastructure requirement



Low throughput network

5G router and Bluetooth capability housed within coastline signage

Opportunity drivers

- Two redeployed parking attendants could save the council an estimated £152/day.
- 55% of people accidently drowned had no intention of entering the water. Safety information displayed on the signage can equip visitors with information to avoid hazards and fatalities.
- The approximate cost of lifeboat launch is £2,639. As a charitable entity, every prevented mission would also be a significant saving to the RNLI.
- The opportunity for local businesses to advertise based on location could drive further custom.

4.3.4 Maritime IoT

4.3.4 Maritime IoT

How might we better serve commercial and research activities requiring live, offshore data collection?

Sensors and other metric gathering devices currently require travelling to and physically checking/collecting/diagnosing. This leads to inefficiencies, cost implications and time/scope limitations.

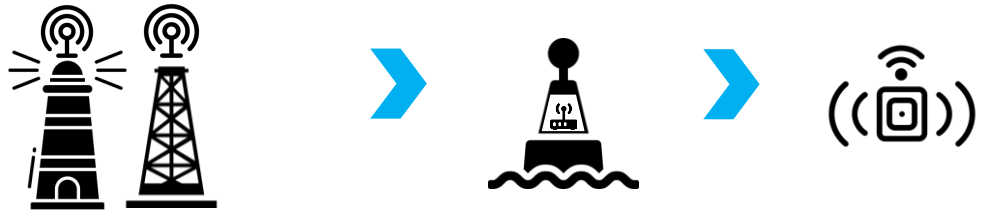
Opportunity

Connection for offshore IoT devices would unlock a range of cost savings and provide previously unattainable data collection for a range of users. For example, real-time monitoring and diagnostics for asset owners, lobster net collection alerts for artisan fishers, seaweed monitoring on beaches for councils, seabed metrics for researchers and watercraft security alarms for insurance companies. Sensors may be stand alone or housed within/on the buoys.

Opportunity drivers

- Dorset has an above UK average number of advanced engineering and manufacturing businesses, yet is challenged with a productivity gap of £1.7b compared to national average[1]. It is hoped that efficiency and productivity would increase through IoT devices.
- Unlock further opportunities and learnings for the research community.

Infrastructure requirement



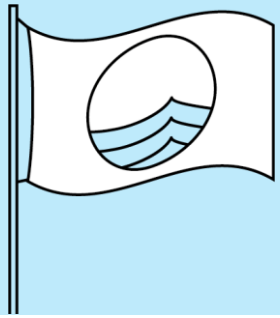
Low throughput network

5G router on buoy allows IoT sensors to provide real time data

4.3.4 Maritime IoT

Example scenario 1

The Blue Flag is awarded to beaches and marinas who meet and maintain a high standard against a series of stringent environmental, educational, safety and accessibility criteria. To further increase the local economy through tourism, Dorset Council aim to have more Blue Flag beaches than any other coastline in the UK. Coastline IoT devices have been able to provide early notifications before a problem arises, so preventative action can be taken, instead of more costly clean-ups and undesirable events.



Example scenario 2

One of the UK's largest natural energy providers is considering building a site along the Dorset coast, creating jobs and contributing to council carbon reduction targets. When a technical fault occurs, a diagnostic team needs to be sent to site to identify the problem and once identified, wait until replacement components are sourced. 5G connectivity enables such high value asset owners to use IoT devices for constant live asset health data, so that early warnings can be notified and repairs can be made before any down time or large incidents occur. Moreover, it also opens the opportunity for robotic operations to be operated remotely, together realising significant cost savings and increased operational efficiencies. Such ubiquitous connectivity, made possible through a 5G network, has the power to vastly increase potential investment appeal.

4.3 Connected Coastline
Implementation Considerations:

Regulation
The Maritime and Coastguard Agency have the ability to either help or hinder progress. Any policy changes could work in the favour of an accelerated roll out, with mandates that push regions towards the solution. Conversely it also has the power to block certain activities or technologies.

Funding
Part funding through calls for public safety or maritime safety is worth exploring. For example, the Fishmonger's Guild has a mission of 'helping build and safeguard a prosperous and sustainable fisheries industry' and offer grants to cover such projects.

Seabed Access
To extend the offshore range, further buoys with 5G modems will need to be deployed. We must be mindful that British sea-beds are owned by The Crown Estate, and so a licence will be required to anchor buoys.

4.3 Connected Coastline
Use Case Readiness:

These use cases were identified as being at the following stages of rollout:

PILOT STAGE
For early-stage concepts

FURTHER TRIALS NEEDED
to develop service

READY FOR ROLL-OUT
Following successful trials

4.3.2 Connectivity for watercrafts

A pilot partnering with the end users to develop the service design will be key for adoption and progression.

4.3.3 Location based information

Expansion of the connected signage in high traffic areas, conducting trials to assess different strategies to increase engagement.

4.3.1 Utilising existing structures for base stations

The base stations installed for the previous phase act as a proof of principle, supply chains and adaptive design need developing to prepare for roll-out.

4.3.4 Maritime IoT

There are many coastal applications where the collection of real-time measurement would be beneficial. Those within proximity to the existing 5G infrastructure and with the largest impact should be prioritised for pilot.

Council Service Delivery

4.4 Council Service Delivery
Use Case Summary:

4.4.1
IOT public litter bins

IOT smart bins will offer a real-time understanding of areas to service, informing more efficient waste collection. In the longer term, this data can help adjust the service delivery for determined areas.

4.4.2
Environmental management

Better connectivity will allow more efficient practices around air and water quality monitoring, enabling real-time data capture, trend analysis and more information for management strategies.

4.4.3
Enabling new transport models

Providing reliable connectivity and innovative transport applications will enable better transport models – serving the last-mile travel needs of the community.

4.4.1 IoT Public litter bins

4.4.1 IoT Litter Bins

Waste management is the third costliest council service. It is highly valued by residents. Overflowing litter bins have a high reputational cost and encourage littering. The amount of waste in litter bins varies across the year. Need for better situational awareness.

Opportunity

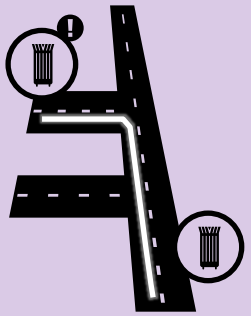
IoT smart bins will offer a real-time understanding of areas to service, informing more efficient waste collection.
In the longer term, this data can help spot trends and help adjust the service delivery for determined areas.

Opportunity Drivers

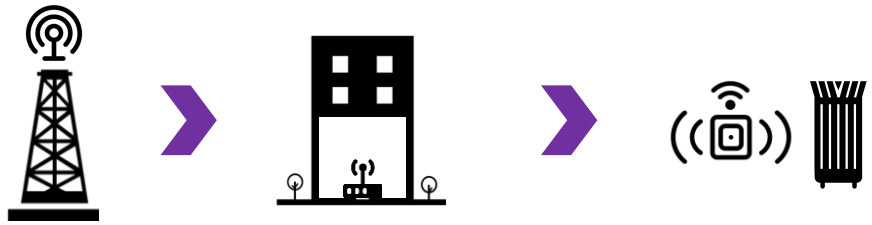
- Street cleaning, waste collection and disposal 2021/22 budget = £27.4m
- Number of public litter bins is currently unknown – emptied on a 'rounds' basis
- Little-used bins are sometimes emptied at the same frequency as heavily used bins
- More effective deployment of bins and resources needed to empty them

Scenario

Waste collection teams at Dorset Council are managed and routed through a centralised platform that receives real-time information on which areas need servicing, choosing the most efficient routes and avoiding duplication.
The platform also shows an aggregated visualisation of which areas have been needing more servicing over time, helping decision makers informing the service delivery planning.



Infrastructure requirement



Low throughput network (IoT)

IoT data shared to council services for decision making

4.4.2 Environmental Management

4.4.2 Environmental Management

Air and water quality management zones require particularly precise monitoring of pollutants. Current collection is not real-time, with officers driving around the county to collect, analyse and post results.

Opportunity

Real-time monitoring allows for better data capture as well as spotting of trends (e.g. at what time of the day there is more pollution), offering more information on possible causes and informing management strategies.

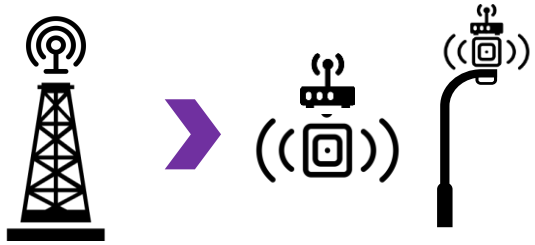
Drivers

- Current cost of data collection = £2,700 /y + employee time and travel[1]
- Currently 6 real-time analysers in place
- Bournemouth had the highest number of days with DAQI score > 4, of any town or city in the UK in 2018[2]
- One in 20 deaths in Bournemouth can be attributed to PM 2.5 pollution (2017)[2]

Scenario

Environmental monitoring officer at Dorset Council is tasked to monitor and review air quality data in specific locations. Connected IoT sensors provide real-time data directly to the council platform, where the officer can monitor the situation in real-time, get notified in case of issues, as well as visualise changes and abnormal trend behaviours in historical data. Data is also shared with other relevant organisations.

Infrastructure requirement



Low throughput network (IOT)

5G-enabled IOT sensors provide data to council

Source
1: Dorset Council
2: Centre for Cities: Cities Outlook 2020 (DAQI = Daily Air Quality Index)

4.4.2 Environmental Management

Implementation Considerations

For implementation, a series of aspects will need to be considered:

User engagement and business model

- Involve users in the design of how this will work
- Test products with end-users as they get developed
- Understand all enablers and potential constraints
- Support the creation of multiple uses and revenue streams for the data and services provided

Processes

- Map out the service delivery: what does the Council do with the data? How is it analysed? What are the new processes that might need to be put in place for that?
- How is the information shared with businesses and local communities?

Data & Platform

- Understand the lifecycle and standards related to the data gathered
- Understand additional technologies needed e.g. AI for analysis
- Understand how the data integrates with existing systems (from council, EA, etc) and whether/how these systems need to be updated
- Test and trial various solutions in different areas to find solution that works

Key stakeholders

- Network Operators: need to build a relationship with one or more MNOs. Integrate neutral host idea, but currently cost/benefit is not clear
- Infrastructure owners: MNO, Trinity House, Environment Agency, Wessex Water, Dorset Council
- Service Providers: environmental protection agencies, one end-to-end solution provider (MNO, equipment vendor or system integrator)
- Customer: council data analysts, Environmental Agency, local population, visitors

Next steps

- Mobilise business change: identify lines of business that could make more efficient use of environmental data and gather their requirements;
- Specifically engage with key stakeholders such as the Environment Agency, raise awareness and gather requirements;
- Map existing assets and coverage for better identification of locations and needs;
- Map current data and platforms in use (e.g. at the council), understand technical requirements and engage with potential service providers;
- Bring council services together: understand how might this data help drive strategies for other departments.

4.4.3 Enabling New Transport Models

4.4.3 Enabling new transport models

In more rural areas, uptake of public transportation can be low and not cost-efficient. Dorset Council subsidised bus routes fallen from 80 to 10 in past 7 years. Traditional public transport models not efficiently serving the last-mile travel needs of the community.

Opportunity

Providing reliable connectivity in more rural areas will enable the community to use a series of applications on the go. For example, one of these apps can be designed for new models of transportation, enabling community-based lift sharing or similar services.

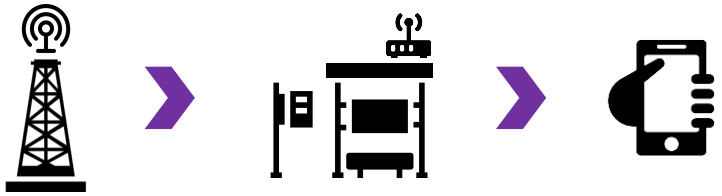
Drivers for opportunity

- Cost for supported public transport routes (including school travel for entitled students) £1,000,000
- Cost for bus passes (including taxi/rail alternatives) £3,000,000
- Currently no demand-responsive services

Scenario

Enhanced and reliable connectivity underpins a public network which allows people to be reliably connected in rural areas.
A community-based lift sharing application, sponsored by Dorset Council, is used by communities living in rural villages to travel from their locations to and from major links to public transport (e.g. the closest train station), covering their last-mile travelling needs.

Infrastructure requirement



High throughput network

5G-enabling more reliable internet connection in rural areas

4.4 Council Service Delivery
Use Case Readiness:

These use cases were identified as being at the following stages of rollout:

PILOT STAGE
For early-stage concepts

FURTHER TRIALS NEEDED
to develop service

READY FOR ROLL-OUT
Following successful trials

4.4.3 Enabling new transport models
Opportunity to pilot connectivity-enabled demand-responsive transport services, such as lift-sharing applications for last-mile travelling in rural areas.

4.4.2 Environmental management
Opportunity to further trial and build upon current IoT technology, for more efficient, real-time data gathering on air & water quality.

4.4.1 IoT public litter bins
Opportunity to further trial and build upon current IoT technology. Possibility of enhancing current tracking systems on council vehicles to optimise rounds.

Connectivity infrastructure as EV chargers *
Idea to pilot use of connectivity infrastructure as EV charging stations.

Flood monitoring*
Opportunity to further trial and build upon current IoT technology, to monitor gullies and understand when areas get to capacity and prevent flooding.

*** These ideas were mentioned in the second workshop, but no further information was generated.**

5

5. SUMMARY & RECOMMENDATIONS

The Challenges and Opportunities of Roll-Out

‘Stackability’ of Use Cases

It has been noted through the work on the 5G RuralDorset project, as well as the subsequent workshop activities, that the ability to stack a variety of use cases together underpinned by the same connectivity infrastructure is one of the strengths of the 5G opportunity. The benefits to this approach lie specifically in an increased economic, social and environmental return on initial infrastructure investment. From an economic perspective, the applications enabled by enhanced connectivity may reduce costs, increase revenues and improve policy compliance.

However, the challenge with this approach is that without identifying one single anchor use case that balances the business case, there is less likely to be one single entity willing to bear that initial cost of investment. The requirement for collaboration between sectors poses a challenging question as to how costs are shared, and who is in the best position to lead.

The implication of this challenge may point toward the need for more central bodies to make the initial investment in order to unlock the value within different sectors. Such bodies could range from local councils, LEPs, or on a national scale, central government departments.

There is a clear opportunity for exploration to better develop and understand the details of the funding formula that would enable a combination of public and private sector investment into connectivity infrastructure.

Roll-out

Whilst national roll-out of connectivity infrastructure could be looked at as one large strategic investment, there is value in exploring a staggered approach to investment in order to unlock high value areas first, which can then support the case for wider roll-out.

This type of regional roll-out requires identifying locations with similar challenge profiles and ambitions to create economic, social and environmental growth through digital transformation. Within each area there are likely to be a set of use cases that make the initial case for investment, and multiple subsequent use cases that will create additional value once infrastructure is in place.

Taking this approach, it seems likely in the first instance that the use cases that are chosen to support investment follow a ‘spend-to-save’ approach, exploring areas where there is currently large local and national spend which, over the course of a short period of time, would be reduced by a factor that provides a valuable return on initial investment.

Infrastructure & enabled applications

This illustration shows how investment in different infrastructure unlocks a range of stackable use cases identified within the workshop.

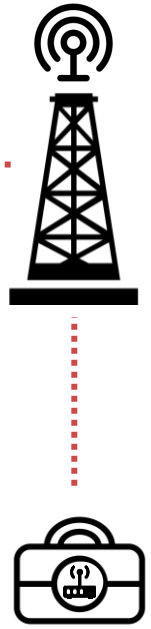
Location-based routers enable:

HIGHER THROUGHPUT

- Health monitoring
- Lone worker safety
- Autonomous Farm Operation

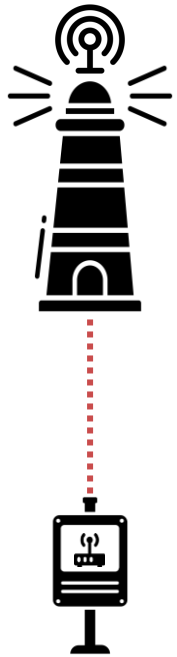
LOWER THROUGHPUT

- Environmental management
- New transport models
- IoT public litter bins
- Remote monitoring of cattle
- Health monitoring



Mobile routers enable:

- Connected health care enabling mobile working



Connected signage enables:

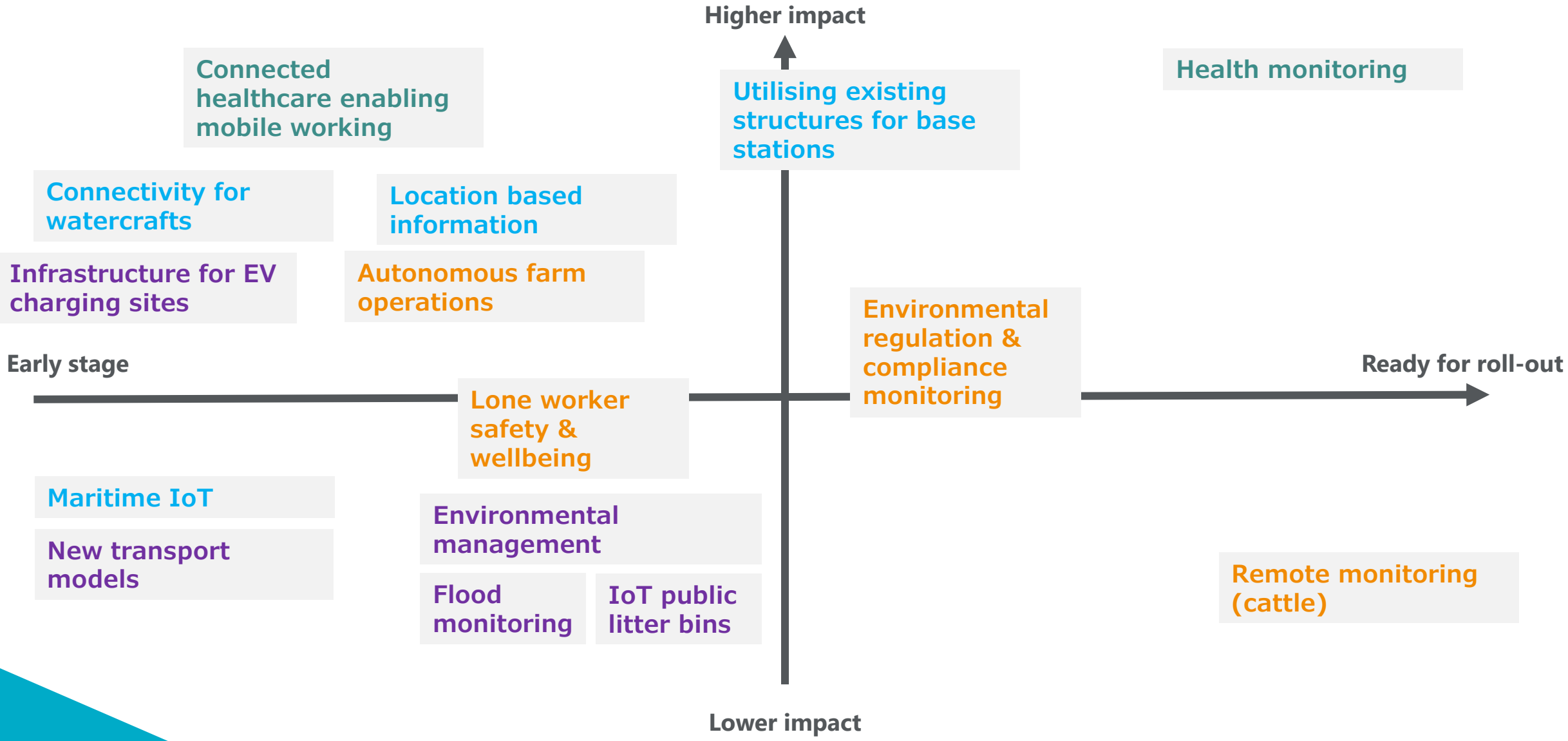
- Location based information
- Tourism services

Connected buoys enable:

- Connectivity for watercrafts
- Maritime IoT
- Pollution monitoring for aquaculture

Use case readiness vs impact

This graphic combines use cases from each sector to gain an overarching look at readiness and impact and support decision making about next step investment.



Strategies for Success: Investment in infrastructure

The table below is a summary of strategies extracted from workshop participants during discussions on overcoming barriers and achieving success, and as such apply to any next steps taken.

STRATEGIES FOR SUCCESS

Sustainability

- Planning for sustainability from outset reduces risk of redundancy
- Gaining multi-stakeholder commitment
- Leveraging national targets such as net zero and levelling up in order to drive long-term funding

Business Case

- Undertaking a high-level options analysis for co-investment by councils / HMG, industry
- Showing the impact of multiple use cases/verticals in a single area - demonstrating demand to encourage investment
- Align future work with Governmental priorities to access national support and funding – found here
- Identifying applications with comparatively large user groups or "big wins" e.g. areas that currently absorb significant council budget and use these to get "buy-in" on an early use case
- Focusing on immediate benefactors and immediate timelines e.g. 1yr or 3yr
- Kickstarting the ecosystem through government subsidies to put infrastructure in place in order to enable market growth
- Moving to a 'spend to save' environment in order to unlock investment
- Wider roll-out leads to more users helping to build business case and improve viability and profitability of infrastructure and application development

Service cost to end users

- Not expecting end users to front service costs that enable infrastructure development. Service costs must be clearly balanced by value created
- Exploring long term financial models that prioritise adoption and long term sustainability would realise a greater user base sooner. The hypothesis is that volume with smaller margins would be more sustainable and see cashflow sooner, rather than larger margins with a smaller number of customers.

Spectrum regulation

- Creating a more flexible approach where spectrum is assigned where it is needed
- Moving to a 'use it or rent it out' model of infrastructure and spectrum

Strategies for success: Increasing adoption

The table below is a summary of strategies extracted from workshop participants during discussions on overcoming barriers and achieving success, and as such apply to any next steps taken.

STRATEGIES FOR SUCCESS
Engagement and promotion • Proactively engaging with the network operator, infrastructure owner, service provider and the customer/end user. Understanding each of their needs and feeding these into the design of a mutually beneficial solution • Creating partnerships with local business who understand the region and are bought into protecting and delivering • Engaging with communities on issues important to them and aligning on which problem needs to be addressed first • Utilising organisations who have seen significant benefits through trials as part of the campaign • Getting buy-in from leadership teams so they can communicate the benefits and promote it. • Being clear that technology is about iterative improvement rather than reinventing the wheel • Running demonstrations of solutions already trialled and ensuring outcomes are accessible to as wide a group as possible • Share stories via media and local communities using non-technical language and emphasising both personal and community benefits.
Skills • LA-wide strategy to build capability and linking to National Skills Fund; HEFE; institutes of technology etc • Ensuring accessible training is available • Showcasing opportunities for students and young people to come to more rural areas, such as Dorset
Building trust • Paying attention to security • Seeking legal advice and best practice guidance for putting in place information sharing and data use agreements. • Inviting expert users to share their experiences
Ease of adoption • Developing technologies that don't require large amounts of training or completely new methods to adopt • Ensuring devices are made to last in-situ for long periods of time. • Leveraging existing and future personal tech devices and wearables • Working with MNOs to ensure a frictionless experience for the user so that their device is able to connect to the 5G network automatically

Strategies for success: National rollout

The table below is a summary of strategies extracted from workshop participants during discussions on overcoming barriers and achieving success, and as such apply to any next steps taken.

STRATEGIES FOR SUCCESS
Lessons learned • Learning from other rollouts • Sharing case studies from existing programmes overseas, e.g. Japan, Canada, Australia • Utilising national forums (e.g. UK5G, UKTDTF) to engage nationally • Promoting the Dorset example nationally. Situating their story within the "rural challenge" so other authorities recognise they could do it too
Partnering for wider rollout • Consider regions that have similar challenges to 'partner' with e.g. coastal, rural etc. Running joint pilots across several regions for one or more specific use cases will demonstrate scalability and benefits across region • Working with other councils would enable shared learning as well as allowing for resources to be pooled • Identifying local authorities who can be part of a fast follower programme • Identify councils taking active roles in funding digital transformation in aligned priority sectors
Incentivisation • Supporting incentivisation for organisations and regions that choose to make the leap for the benefit of the wider sector

NEXT STEPS

Following analysis of the workshop outputs this report identifies two categories under which next steps fall:

1. Local and regional
2. National

Local / Regional

Phase 2 project leveraging a spend-to-save approach to infrastructure investment, initially targeted at reducing health and social care costs, whilst proving further 5G enabled applications to create additional revenue streams for local economic, social and environmental growth.

One key insight that became clear from the workshops was the current cost of health and social care to Dorset Council, and the opportunity to take a spend-to-save approach that would leverage connectivity as a means of long-term cost reduction.

Taking this into account, combined with the fact that the health monitoring use case that emerged as the most market ready and impactful, suggests that a phase 2 project could be taken forward where initial investment is made in long-term connectivity infrastructure that focuses on delivering health and social care benefits, and in doing so creates an environment for further revenue streams to be realised based on the parallel use cases that required slightly more development and trialling.

Key Stakeholders:

In such a follow-on project, Dorset Council, the Satellite Applications Catapult and DCMS could work together to create a proposal that would highlight projected growth which would outweigh initial investment.

Key Activities:

- Project extension to ensure momentum is not lost.
- Deep dive business case to explore cost reduction that could be expected from enhanced connectivity enabled services*.
- Exploration of strategic locations to implement connectivity in order to have maximum impact.
- Detailed analysis of infrastructure requirements and associated costs to enable delivery of use cases.
- Discussion with neighbouring regions as to interest in partnering on a larger scale roll-out proposal centred around health and social care.
- Engagement with key stakeholders within NHS as well as end user communities and developer communities in order to ensure applications being developed meet all requirements.
- Analysis of business models of new applications in order to enable affordable access.
- Discussion with infrastructure operators in order to agree key roles.
- Development of funding formula that enables combination of public and private investment into infrastructure.
- Dorset to become a showcase for other regions to demonstrate value of connectivity for healthcare, as well as subsequent applications that return additional value.

*See Satellite Applications *Strategic Business Case* document

Regional / National

Strategic engagement with central government alongside targeted discussions with local councils and LEPs in order to identify suitable locations to invest in connectivity infrastructure in order to enable cross sectoral growth in high priority areas.

The challenge landscape around Dorset has parallels with numerous areas across the UK. Rural connectivity is a central government priority, and the sectoral growth it enables links directly to the levelling up agenda.

However, whilst rural connectivity is a recognised challenge, there is not widespread agreement on the solutions and approaches to affect sustainable change. The 5G RuralDorset project has demonstrated the value that can be brought through enabling connectivity infrastructure, and alongside further local activities, the learnings should be brought to other regions to stimulate further growth.

Whilst the Satellite Applications Catapult and DCMS are well positioned to initiate conversations and support these activities, it is essential that such programmes are locally led, designed around local priority sectors, and in partnership with local end users.

In parallel with engagement across the UK to stimulate local interest and activities, conversations with central government should continue in order to help remove some of the barriers that may currently be blocking widespread growth in 5G applications.

Key Stakeholders:

The Satellite Applications Catapult can lead conversations with local stakeholders to stimulate interest. LEPs and local councils should be prioritising the opportunities for connectivity and leading programmes to trial and test new applications. DCMS has a key role to play in coordinating and contributing to a strategically approached UK-wide roll-out.

Key Activities:

- Initial meetings between Catapult and DCMS in order to agree on approach to exploring connectivity solution roll-out.
- Mapping activity of locations across the UK with similar challenge profiles around rural connectivity.
- Strategic engagement with local councils and LEPs to socialise outputs of 5G RuralDorset project and areas where connectivity can add value.
- Prioritisation activity done on case-by-case basis to identify focus areas for connectivity trials.
- Business case for investment made based on high priority areas alongside analysis of infrastructure required to enable growth.
- Investment in infrastructure made in strategic locations alongside the growth of associated innovation environments that support the development, trialling and piloting of new applications and services.

Thanks

If you have questions on any aspect of the process, please don't hesitate to get in touch with us and email:

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