CHANGE MAKERS

UNLOCKING INNOVATION

A systems approach to addressing the shortage of chemistry labs for startups

September 2024

ROYAL SOCIETY OF CHEMISTRY

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THE CHALLENGE

Whether it is about climate change, human health or sustainable industries, we are in the decisive decade to make progress. Deep tech chemistry can transform the way we live today and help secure a cleaner and better future.

However, entrepreneurial ventures developing these technologies are stuck. With long experimental and development timelines, ventures cannot find suitable facilities to carry out the research or scale-up of these technologies. Game changing technologies are not reaching their potential. **No laboratory, no technology research, no impact.**

The lack of access to suitable laboratory facilities at different stages in deep tech chemistry development has persisted for decades, perpetuated by siloed thinking, bureaucracy and an unsupportive system. Together with stakeholders from across the system we have embarked on a journey to understand the challenges holding back the availability of chemistry laboratories across the UK, starting with the needs of early-stage ventures.

What is deep tech chemistry?

First used in our *Igniting Innovation* report, when we refer to “deep tech chemistry” we are referring to a subset of deep tech businesses that are using chemistry as the core of their intellectual property and scientific advancement.

SPOTLIGHT ON DEEP TECH CHEMISTRY VENTURES

mimica

Radically reducing unnecessary food waste with dynamic expiry labels

A net zero food system is impossible to achieve with the current expiry date system.

An estimated third of all food produced globally is wasted, generating 8-10% of global emissions, and yet 70% of the food wasted by UK households is still perfectly edible.

Bump by Mimica is an award-winning label that turns bumpy when food spoils, based on actual temperature conditions. It provides real-time confirmation of the product's freshness with a uniquely tactile user experience, showing the true longevity of the food, fighting unnecessary food waste and associated greenhouse gas emissions.

By adding just two days of shelf life to products, we could cut unnecessary food waste in half.

Image credits: Top - Sheffield Hallam University, bottom - Mimica

Notpla

Convenience doesn't have to cost the world

Plastic pollution has become one of the biggest threats to our environment and our future.

Plastic in the ocean is expected to outweigh fish by 2050, there are more than 3,200 known toxic substances present in plastic, and over 90% of plastic pollution is from single-use items. Notpla is a family of regenerative packaging materials, made from seaweed and plants, for many everyday applications – including food containers, seaweed paper, and dissolving pods and films.

Notpla's food containers produce up to 70% less CO_2e greenhouse gas (GHG) emissions than the conventional plastic alternatives and their seaweed paper uses less than 60% of the water traditional paper production does.

Image credit: Notpla

MediSieve

Eliminate. Isolate. Cure.

MediSieve's Magnetic Blood Filtration technology aims to revolutionise medical treatments, especially for diseases where conventional therapies fall short.

This technology addresses the critical challenge of removing specific components from the bloodstream that current methods cannot effectively target. This issue is particularly pronounced in Adeno Associated Virus (AAV) Gene Therapies, where up to 60% of potential patients — about 880,000 people — are ineligible for a treatment that may be their only option.

MediSieve offers a precise solution for treating various bloodborne conditions by directly removing harmful substances from the bloodstream. Its ability to target a wide range of substances makes it a powerful tool in medicine, promising better patient outcomes, reducing health inequities, and paving the way for more personalised and effective disease management strategies.

gaussion

Making batteries faster

Electric transport is key to a low-Carbon economy, but range anxiety, long charging times and battery degradation remain issues. Gaussion's fast-charge technology - MagLiB™ - is changing the EV charging game.

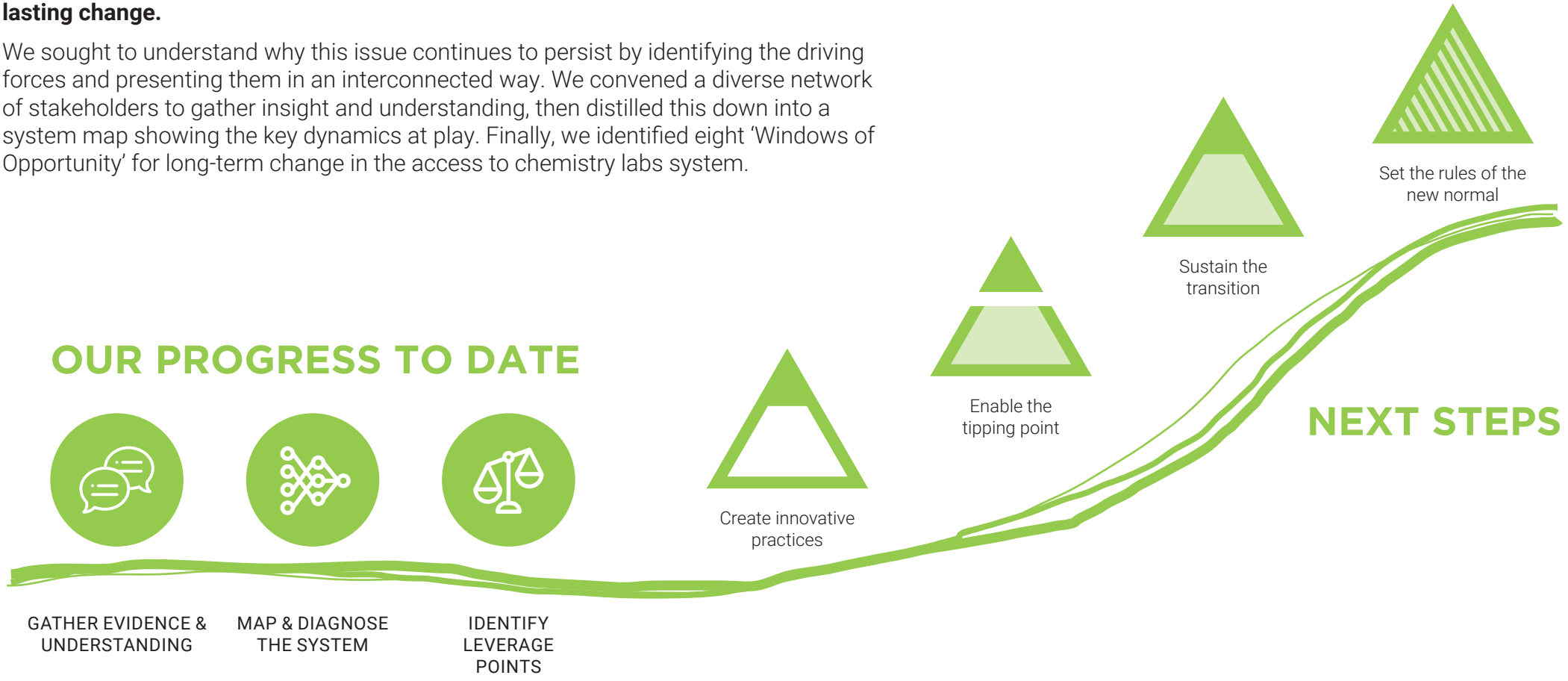
Its quick charging technology improves battery performance by utilising an external magnetic field during charge and discharge cycles. Additionally, the magnetic field reduces cell deterioration, prolonging battery life. MagLiB™ can complement any battery and improves affordability, increases battery convenience, and reduces embedded carbon impact.

This holds huge potential for the widespread adoption of electric vehicles and the clean energy transition in general.

OUR SYSTEMS APPROACH

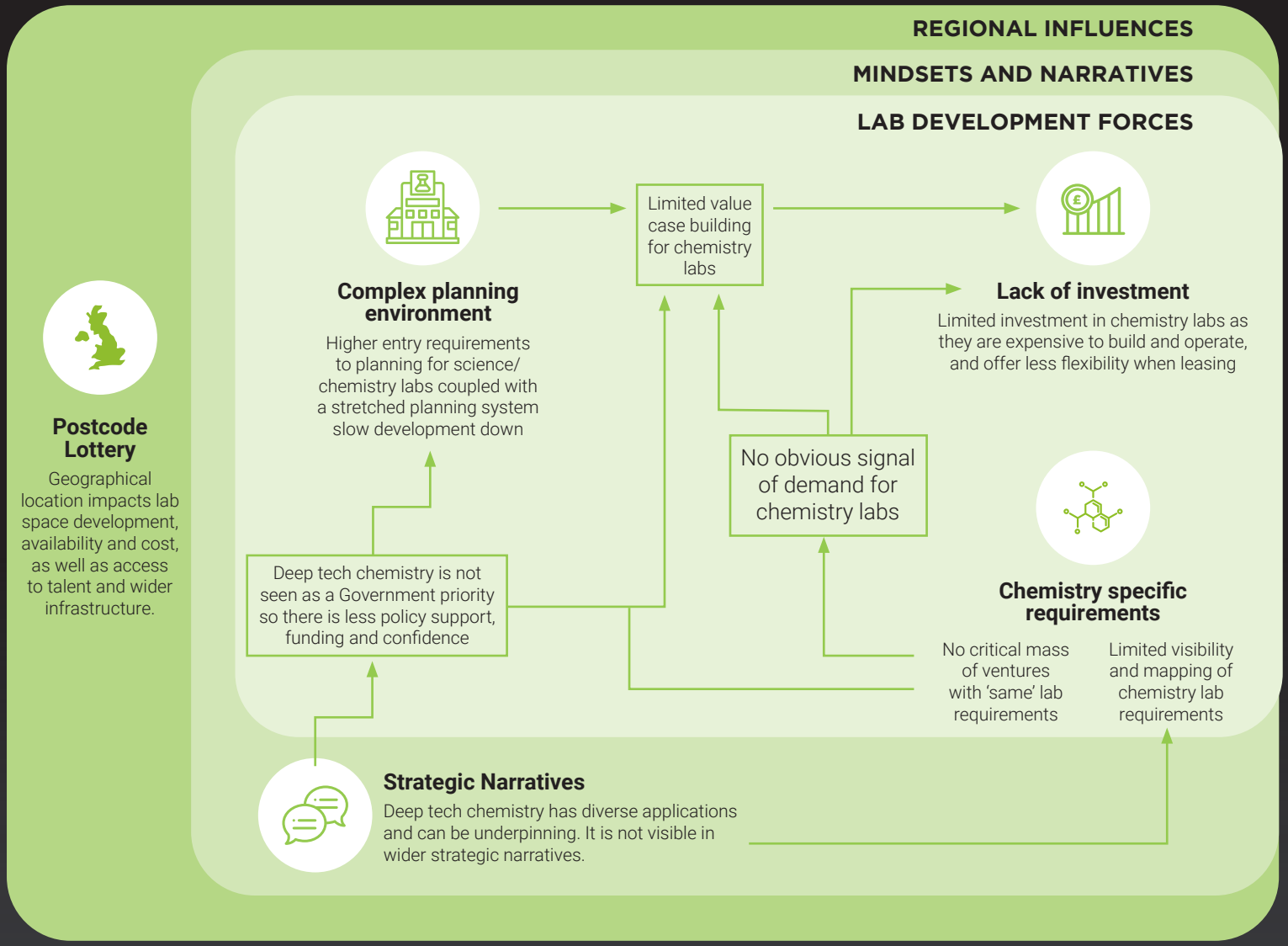
Complex and enduring problems – like a lack of access to chemistry labs – require an approach that identifies the root causes and where best to intervene to deliver lasting change.

We sought to understand why this issue continues to persist by identifying the driving forces and presenting them in an interconnected way. We convened a diverse network of stakeholders to gather insight and understanding, then distilled this down into a system map showing the key dynamics at play. Finally, we identified eight 'Windows of Opportunity' for long-term change in the access to chemistry labs system.



Adapted from the Forum for the Future
https://www.forumforthefuture.org/sustainability-and-system-change

WHAT IS THE SYSTEM TELLING US?



KEY DYNAMICS

- Lack of investment
- Complex planning environment
- Chemistry specific requirements
- Strategic narratives
- The postcode lottery

WHAT IS THE SYSTEM TELLING US?

Development of lab space requires investment – and we tend to see significantly less in space that is suitable for deep tech chemistry ventures.

This is mostly driven by a lack of value case. Chemistry labs are expensive to both build and operate. This is a result of specific and complex space requirements (such as more robust air handling requirements, or higher spec'd wet lab areas), a high cost of materials, and the need for high-spec equipment that requires specialist knowledge to operate.

The value case is further unsupported by a lack of robust demand data. The variation in how deep tech chemistry is applied means there is little evidence of a critical mass of demand for chemistry lab space. No detailed mapping of demand (including volume, potential pipeline, location and specification) is currently visible for chemistry labs.

Deep tech chemistry is also not visible or represented in any strategic narratives or Government priorities. This contributes to challenges around general understanding of needs, funding, adequate policies, and investor confidence.

DYNAMIC 1: LACK OF INVESTMENT

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The value case is further unsupported by a lack of robust demand data. The variation in how deep tech chemistry is applied means there is little evidence of a critical mass of demand for chemistry lab space. No detailed mapping of space requirements (including volume, potential pipeline, location and specification) is currently visible for chemistry labs.

DYNAMIC 2: COMPLEX PLANNING ENVIRONMENT

Chemistry lab space sits within a **complex planning landscape**. Standard office to lab conversions are less viable for chemistry, **air handling and net zero requirements introduce additional barriers** to the planning application process and some face **local challenges around resources** such as water and power.

This is exacerbated by the **lack of planners available to deal with science applications**, which can create bottlenecks in high demand areas– a challenge for developers and perpetuating factor in the supply/demand imbalance.

Coupled with the weaker value case for chemistry lab space, developers are more likely to favour office/ residential space or more flexible laboratories.

DYNAMIC 3: CHEMISTRY SPECIFIC REQUIREMENTS

The application of deep tech chemistry is diverse and technologies do not sit solely in one sector, giving rise to an assumption that lab space requirements will vary by venture. The current approach to developing chemistry lab space is therefore to retrofit on a case-by-case basis, a less efficient and more expensive method for both operators and users.

This perception of variability means **there is no obvious critical mass of ventures with the 'same' chemistry lab requirements** and thus no signal is sent to investors and developers that chemistry lab space is needed. It also gives rise to a concern that space will be less flexible and unsuitable for other tenants once a venture moves.

This means **less lab space has chemistry designed in from the start and in many instances is not developed at all**.

DYNAMIC 4: STRATEGIC NARRATIVES

Deep tech chemistry can be found in diverse applications, has the ability to address a variety of problems and often **the underpinning nature of the deep tech technology renders chemistry invisible in the final product or solution**.

This lack of tangible presence propagates to broader understanding and **inability to make the value case for deep tech chemistry technologies** and therefore gets missed in the national priority agendas.

The effects of this are seen in **limited government intervention in the form of supportive policies and incentives to encourage investment into chemistry lab space**. It also exacerbates the lack of confidence in the deep tech chemistry sector and means data and analysis which could boost this confidence – for example, specific demand and requirements mapping – does not exist.

DYNAMIC 5: THE POSTCODE LOTTERY

For access to chemistry labs, it really matters where you are.

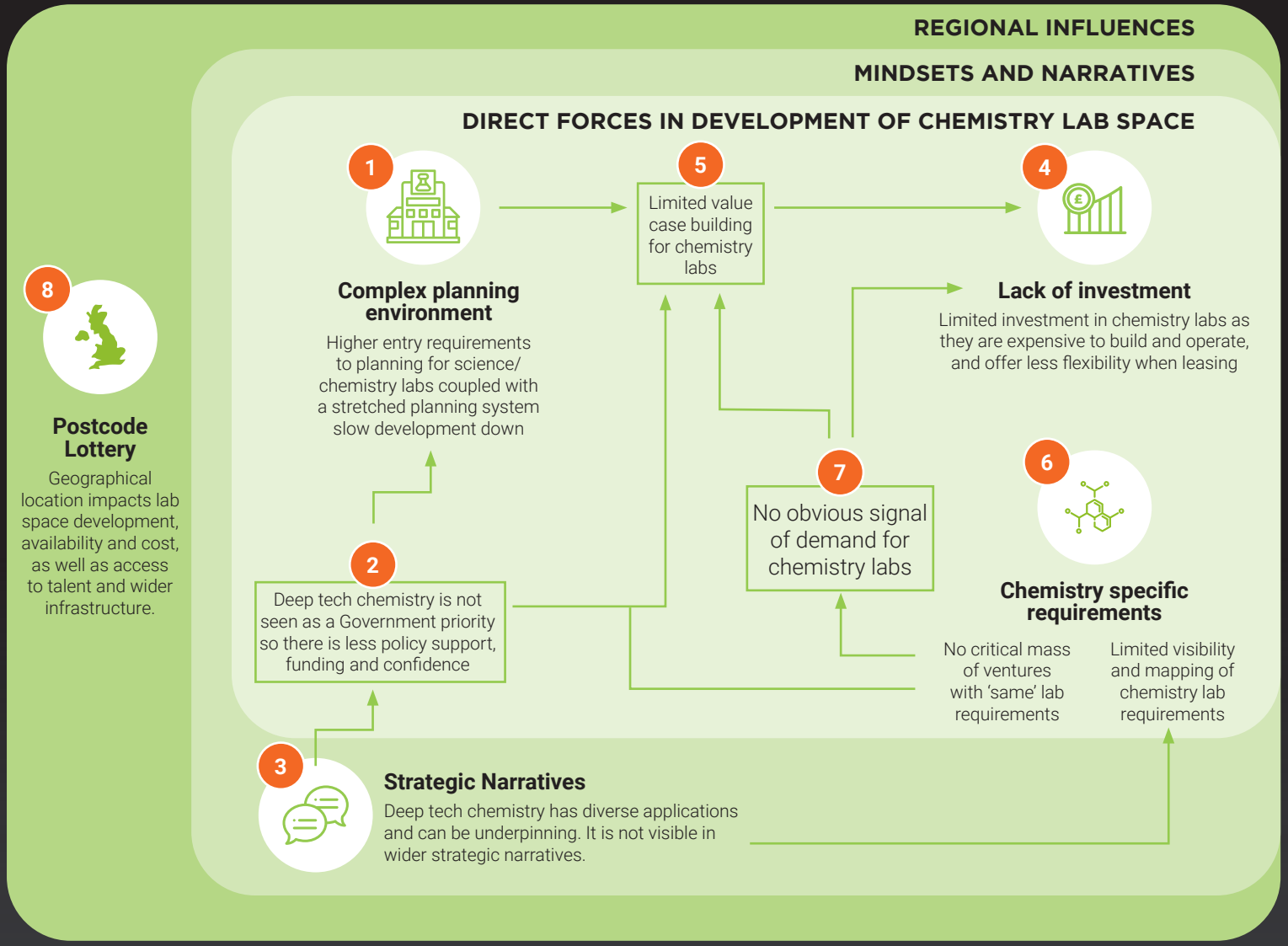
The geographical location of a deep tech chemistry venture can either amplify or ease the effects of the dynamics we have outlined so far and has a direct impact on the availability of investment, access to talent, and affordability of lab space.

Ventures located in an established scientific cluster – such as the Golden Triangle (London, Oxford, Cambridge) – are in a much more favourable environment for spinning out. **More investment flows here and there's a larger talent pool** thanks to strong anchor institutions or universities. However, this comes at a cost – to ventures, developers and the region itself. **Waiting lists are lengthy, cost per square foot is high and well-connected space is limited**. In Cambridge, there are challenges around availability of water. As clusters grow, and demand for urban space rises, access to resources will become even more critical.

In areas with less established clusters and supporting infrastructure, there is a more uneven spread of lab space. Lab space may be cheaper, but the trade-off for ventures is less potential for raising significant investment, a smaller talent pool, and still, this space is unlikely to be designed with chemistry in mind from the start.

We cannot ignore this, both in understanding how the system works and how we begin to change it. **Geography must be considered in any intervention**. A UK-wide, one-size fits all approach will not make the change required to address the effects of regionality.

HOW DO WE LEVERAGE CHANGE IN THE SYSTEM?



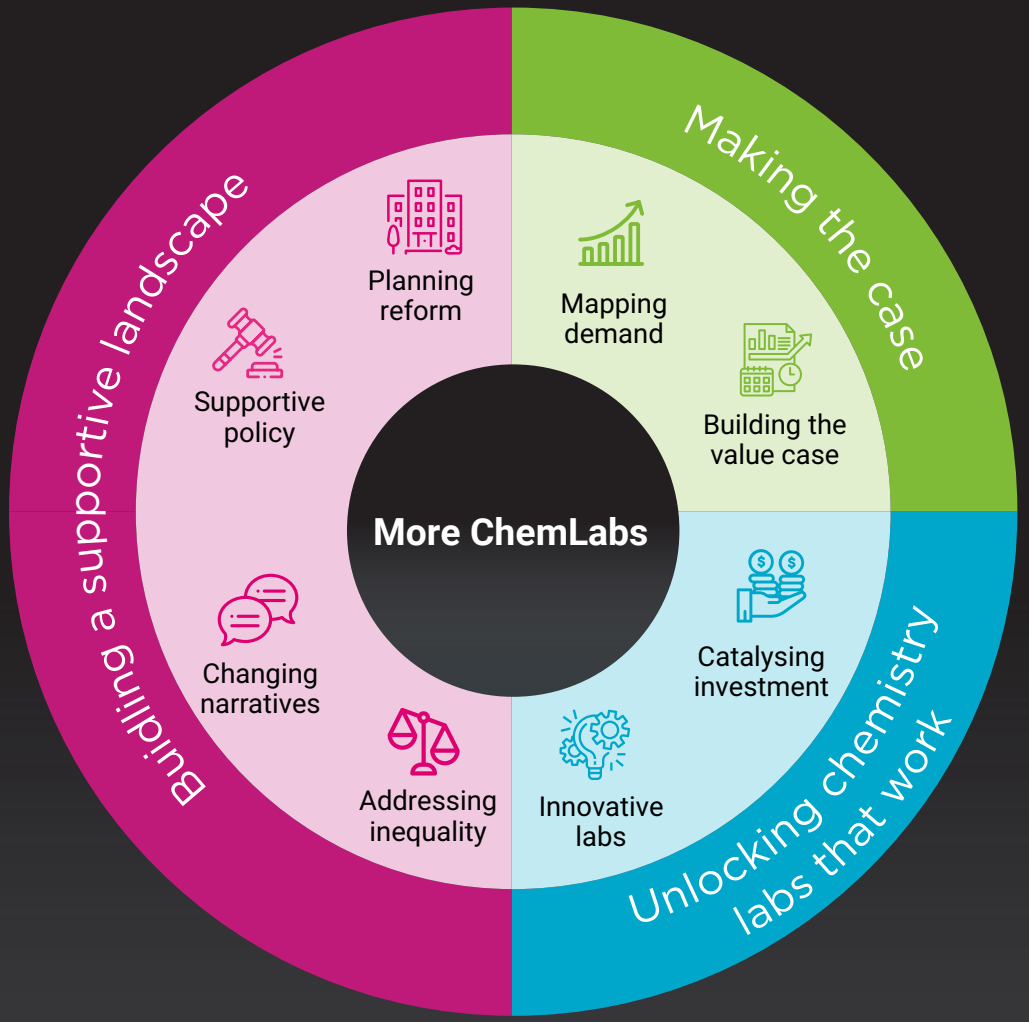
1. **PLANNING:** How might we unlock the planning system so it facilitates smoother development?
2. **POLICY:** How might we influence and create an enabling policy environment?
3. **NARRATIVE:** How might we use new narratives to unlock deeper catalytic actions?
4. **INVESTMENT:** How might we catalyse investment into chemistry enabled Lab space?
5. **VALUE CASE:** How might we make the value case for investing in chemistry lab space?
6. **INNOVATION:** How might we catalyse development of lab spaces that incorporate complexity and flexibility?
7. **DEMAND:** How might we make visible the "true" demand for chemistry lab space?
8. **REGIONAL INEQUALITY:** How might we ensure our catalytic actions help us shift the regional structure?

WINDOWS OF OPPORTUNITY

We have identified eight 'Windows of Opportunity' across the chemistry lab system which have the potential to supercharge the impact of deep tech chemistry technology through improved access to labs.

Taking practical action against all of these areas has significant potential to drive impactful system change.

This will take collaboration of stakeholders from a range of disciplines, dedicated to the same vision of improving the availability of chemistry labs for startups.



WHAT NEXT?

We are launching the More ChemLabs initiative to catalyse system level change and address the shortage of chemistry labs for startups.

We will lead a network of change agents from various sectors to seize the windows of opportunity and develop a portfolio of innovative innovations.

We need people who are innovating in the delivery of lab space that works for deep tech chemistry, who are advocating for and unlocking investment into spaces that work. This will involve sharing stories of change, building a robust evidence base and developing specific solutions.

Is this you?

For information on how to get involved,
visit: rsc.li/morechemlabs

CHANGE MAKERS

ROYAL SOCIETY OF CHEMISTRY

HELP POWER POSITIVE CHANGE

THE CLIMATE CRISIS
THE HEALTH CRISIS
THE FOOD CRISIS...

We need solutions to the many challenges facing our world – and we know that deep tech chemistry entrepreneurship has the power to deliver change. This is why we work with passionate, visionary entrepreneurs, alongside many other actors in the entrepreneurship space.

We want to see as many technologies with potential to make a positive impact on climate change, human health, sustainable industries and planetary health as possible to be successful on their journey from idea to impact. Our goal is to help shape a better future for the current and future generations.

WHAT IS CHANGE MAKERS?

We are Change Makers, a dynamic entrepreneurial ecosystem powered by the Royal Society of Chemistry. We believe that the problems in today's world are complex and interconnected, and this is why we create change at multiple levels.

We accelerate ventures through our Impact Accelerator. We catalyse change in systems surrounding the ventures. We shape opinions and narratives.

THROUGH DEEP TECH CHEMISTRY, WE HAVE THE POWER TO CHANGE THINGS FOR THE BETTER.

JOIN US.
BE A CHANGE MAKER.

CHANGEMAKERS.RSC.ORG

WITH THANKS

We would like to thank everyone who has shared their experience, knowledge and understanding to help us develop the system map and opportunities for change.

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