GREENING IMPERIAL

A call for action on sustainability and climate change

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Executive Summary

This paper arises from the Greening Imperial Scoping Study, approved by Provost's Board in February last year. The report is a call to action – action to raise Imperial's aspirations and achievements in creating a sustainable, low-carbon future for itself and the world. After all, if a university such as Imperial cannot take a long-term systems view, how can we expect governments and society at large to take these challenges seriously?

"I am proud to be at a university that is taking action on this important agenda"

Imperial has much to be proud of. We contribute significantly to the science, policy and innovation that will guide the development of this cleaner future. Our portfolio of research in sustainability in excess of £115m reflects this. Our deep ties to the UK Energy Research Centre (UKERC), the Intergovernmental Panel on Climate Change (IPCC) and Climate-KIC are avenues that create impact for this research. Our postgraduate degrees in energy, sustainability and climate change are creating influential agents of change.

"Please do something about this. I'm ashamed to work at a university that's supposed to pioneer sustainability but are this bad at practicing what they preach"

Whilst there are successes to celebrate, there is more to be done. Imperial ranking in the bottom 10% for university sustainability casts a sharp focus on the reputational risk of inaction – with students, funders and society at large.

Our position as leaders of technical progress, ushering in a better future, will be damaged if we cannot transform the fabric of the College. Our infrastructure and operations need step change improvements in their environmental sustainability. Our impact on the world demands that we equip our graduates – the engineers and financiers of the future - to create a sustainable low-carbon economy. In parallel, we must find improved channels for translation of our sustainability research into societal impact. These are big challenges, but ones that we must address.

To achieve this transformation, the College must have a strong Sustainability Vision embedded in its Strategy and College Leadership needs to demonstrate strong, enduring and visible commitment and ambition. We can learn from others that are leading the way: our peers, including MIT and Cambridge, have embraced a deep commitment to sustainability, which enhances rather than compromises their research and teaching. We have identified over 300 staff and students who would actively volunteer to support these efforts.

"Great that Imperial is finally looking into sustainability and its contribution to climate change"

Our main recommendations are:

1. The creation of a **post of Assistant Provost (Sustainability)** (APS). The APS will be the focus for Greening Imperial and drive the transformation of our performance and delivery in this area. The APS will work with all arms of the College and engage the College community to develop our approaches to delivering more environmentally-sustainable infrastructure, operations and decision making, and universal education in sustainability at undergraduate level.
2. The setting of meaningful **sustainability targets** that are consistent with national and local targets and put College in a leadership position, covering greenhouse gas emissions, waste management, chemical footprint, sustainable transport and water use. For example: zero direct greenhouse gas emissions by 2040.
3. The APS be charged with **engaging the Imperial community and its networks** in developing viable routes to delivering these targets and holds us to account. This role is particularly important as we develop Imperial's new campus.

These actions will deliver a step-change in Imperial's public and professional reputation and the impact on society of our people and research outputs, as well as financial returns from significant reductions over time in energy and other utilities costs.

"I'm delighted this topic is now on the College's agenda"

(quotes from survey participants)

Executive Summary 2

1 Context and Drivers 5
1.1 Imperial's Role 7
1.2 Strategy 2015-2020 7
1.3 The Motivation 8
1.4 Acknowledging Risk 15

2 Vision 17
2.1 Overall Vision 17
2.2 Operations 17
2.3 Governance 18
2.4 Education 18
2.5 Research 19
2.6 Impact 19

3 Governance Structures 20
3.1 Introduction 20
3.2 College Policy and Strategy 21
3.3 Leadership 23
3.4 Decision-Making 24
3.5 Campus Community Engagement 28
3.6 The way forward 32
3.7 Resources 35

4 Operations 36
4.1 Introduction and Drivers 36
4.2 Government and Funding Authorities 37
4.3 Imperial's Current Standing 38
4.4 Improving the sustainability of our operations 41
4.5 Challenges and opportunities in Operations 50

5 Education 55
5.1 Teaching and Learning Content 55
5.2 Current sustainability and climate change education at Imperial 55
5.3 Enhancing our Teaching Offering 58
5.4 Possible Actions 60

6 Research 61
6.1 Faculty and Departmental breakdown of research funding 61
6.2 Vision 65
6.3 What are the current opportunities? 65
6.4 Recommendations 69

7 Societal Impact 71
7.1 Context 71
7.2 What routes do we currently use to support wider societal impact? 71
7.3 Our societal impact so far 75
7.4 How can Imperial do more? 78

8 Action Plan – Recommendations 82
8.1 Context 82
8.2 Recommendations 84
8.3 Action Plan 86
8.4 Specific Recommendations for Key Sectors 91

1 Context and Drivers

This is the full report from the Greening Imperial Scoping Study, carried out with the endorsement of the Provost Board following the presentation of a paper ('Making Imperial College London a Leader in Sustainability and in Action on Climate Change') on 24th February 2017. The aim was to establish Imperial's current position and activities in this area and to explore how to envisage and transform Imperial into a university that is a pioneer and exemplar in this field, ultimately becoming one of the most sustainable and respected universities globally.

Sustainability and climate change are arguably the most urgent and significant contemporary challenges humanity faces. Sustainability is a complex concept and the most widely accepted definition of sustainable development is taken from the 1987 Brundtland Report, Our Common Future: 'Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.' It can be argued that throughout history, the human race has progressed and flourished by unsustainably exploiting the natural world for its resources and services. Furthermore, with a burgeoning human population and increasing demand for material goods, it is arguably imperative over-exploitation of finite resources is prevented, development proceeds within the natural limits of the planet and adequate pollution control and abatement measures are taken, so as to conserve the Earth for future generations. For true sustainability to be achieved, all three of its principles, economic, environment and social, need to be considered and encompassed.

Climate change is a global, complicated and escalating issue. Ninety-seven percent of climate scientists agree that climate-warming trends over the past century are very likely due to human activities which produce greenhouse gas emissions, such as burning fossil fuels. Significant impacts of climate change, which include changing weather patterns, rising sea levels and more extreme weather events are and will continue to be felt across the globe, impacting ecosystems, economies, food and water supplies and human health.

The scoping study initiative, branded as Greening Imperial, was motivated by a realisation that many of Imperial's major competitors, both nationally and globally, are prioritising, embedding and advancing sustainability practices as core values, adopting a prevailing, high profile in this space. In contrast, the College's stance, operations and vision are neither clear nor very visible. Moreover, Imperial's performance in university sustainability ranking tables, such as the 2017 People and Planet Green League of Universities, was extremely poor, suggesting either mediocre performance or inadequate communication on sustainability and climate change issues.

The Greening Imperial study was carried out with the background of a major shift and growth in momentum for action to make the world more sustainable, lower carbon and more resilient to human-induced environmental degradation and climate change. In 2015, governments from around the world agreed to the seventeen United Nations Sustainable Development Goals (SDGs)[1]. These SDGs range from tackling poverty, reducing inequalities and improving human health, through to protecting biodiversity and taking action on climate change. Each goal has specific targets to be reached over the next fifteen years and everyone needs to do their part to mobilise efforts, including governments, educational institutions, the private sector and civil society.

Shortly after governments signed up to the SDGs, in December 2015, 196 nations also endorsed the Paris Climate Change Agreement, committing to, inter alia, 'holding the increase in the global average temperature to well below 2 C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 C above pre-industrial levels.'

These milestones allow for universities to contemplate their role to society in visioning and realizing a more sustainable future locally, nationally and globally, providing an unparalleled opportunity through transformative change to highlight pathways for sustainable transition. Universities, through their research, teaching and outreach activities, arguably have a unique, responsible and influential role in addressing the urgent, global challenges of the 21st century. Being at the forefront of research and innovation, coupled with a diverse international community, they can lead by example whilst educating a new generation of global change-leaders.

The study sought to identify opportunities for action and integration across six areas of the College's activity: Operations, Education, Research, Influence (Policy), Outreach and College Community Engagement/Advancement.

It set out to:

- Establish what we are doing now in these six areas on sustainability and climate change action
- Benchmark Imperial against other universities
- Identify challenges and opportunities for future action and integration
- Test the appetite of staff and students for active engagement with future initiatives
- Make recommendations for a three-year plan about practical ways the College can enhance its sustainability and climate change mitigation offering.

[1] http://www.un.org/sustainabledevelopment/

1.1 Imperial's Role

Imperial College London was founded in 1907 and has an international reputation for excellence in teaching and research: a global top ten university, Imperial has a world-class reputation in science, engineering, business and medicine. Imperial is home to the greatest concentration of high-impact research of any major UK university. In the Times Higher Education World University Rankings 2018, Imperial ranked third in Europe and eighth in the world. The College has a diverse academic community, attracting undergraduates from more than 125 countries and is the UK's most international university. Imperial is home to 17,000 students and 8000 staff. Thus, there is untold, pervasive human capacity, knowledge, enthusiasm and experience to 'tap into' and utilise.

As a world-class university, Imperial has the expertise, proficiency and influence to contribute to tackling contemporary global challenges in a variety of ways. Our direct actions on campus, our research and teaching, innovations, strong leadership and collaborations with governments, non-governmental organisations (NGOs) and industry can all have a major impact nationally and globally. Using these routes to actively address the climate change and sustainability agenda will demonstrate our commitment to international efforts on sustainability, as well as motivating and engaging our campus community of students and staff, enhancing our brand and image, and managing any reputational risk.

Imperial has a number of campuses in London and the South East, including South Kensington, Silwood Park and the new White City development. The main campus at South Kensington has particular challenges, including inter alia, its urban sprawling location in central London; limited outdoor space; many old, heritage and diverse buildings, as well as energy intensive laboratories. The new White City development provides the opportunity to build a sustainable, pioneering, 'green' campus, utilising contemporary technologies.

1.2 Strategy 2015-2020

Imperial has successfully fostered a culture and atmosphere of intelligence, achievement, scientific rigour and expertise in its field. The College's overarching strategy aspires to build on this and make a difference in the world, stating "We will substantially increase our involvement in advising governments and industries on key policy areas such as science and innovation, education, health, energy and the environment, using alumni relationships, professional contacts and opportunities to bring key decision makers to the College."

This strategic objective can be delivered, at least in part, through a more concerted effort to be leaders on climate change and the environment – from action on our site, through to education, research, testing and deploying new discoveries, and sharing our knowledge with decision makers.

As highlighted in the strategy, "We will work with stakeholder groups including technology user groups, social networks and patient communities to help make our work relevant to the needs of society." Achieving the College's goals will depend on supporting and working with the Imperial community of staff and students, as well as our relationships with external stakeholders.[2]

1.3 The Motivation

1.3.1 Benchmarking progress – are we falling behind?

Over recent years, universities both nationally and internationally have been addressing and taking increasing action related to sustainability on their campuses and beyond. Various benchmarking and ranking systems have evolved to compare higher education intuitions both in the UK and across the globe, arguably demonstrating an increasing demand for universities to improve in this area and lead by example. Analysis from various ranking methods show the College has not been leading in this field, but rather trailing behind.[3]

In November 2017 the annual 'People and Planet' Green League of Universities was published, in which Imperial College London was ranked a disappointing 141st out of 151 British Universities and was classified as 'failed'. Manchester Metropolitan University topped the list, with Oxford 54th, Cambridge 58th and UCL 26th. 'People and Planet' is a student action group that has been publishing the Green League of Universities since 2007, ranking UK universities by environmental and ethical performance. Each year, the Green League receives extensive press and media coverage, notably in the Guardian newspaper and on their website. Following the recent publication, many articles and comments highlighting Imperial's low ranking were published online. This may arguably damage Imperial's public and professional profile and reduce its attractiveness to prospective students and staff, as well as dampening the morale of those currently in College.

According to People and Planet's website, the results of the League are based on:

- 50% from information made public on the university website.
- 50% from information published within the Higher Education Statistics Agency (HESA) Estates Management Record (EMR) data set for the previous academic year and other independent and external verification agencies.

The Rankings cover thirteen sustainability areas, including inter alia, environmental policy, education, carbon management, staff and student engagement, ethical investment and waste

[2] https://tinyurl.com/imperial-strategy-2020

[3] Alepi, M. 2017 Thesis: *Sustainability at Imperial College London: Benchmarking performance and best practice towards leadership*

and recycling. Universities are told when their websites will be assessed, thus giving them time to update relevant information and data, as well as to post important documents such as carbon management plans. Assessments begin in July of each year. This report examined Imperial's poor performance in these latest rankings. It is concluded that this is partly due to Imperial's meagre reporting and promotion of its good practices on the website but also due to inadequacies in leadership, policies, targets, practices and community engagement. However, the College received no recognition for the extensive, world-class work of the Grantham Institute, the Centre for Environmental Policy (CEP,) the Energy Futures Laboratory, or the Department of Life Sciences (particularly, the Master's Degree in Conservation Science) because education for sustainable development was not embedded in the College's general curriculum. Thus, it is not an accurate reflection of Imperial's 'green educational credentials.'

Nonetheless, now these failings have been identified, Imperial does have the opportunity to remedy these issues and therefore considerably improve its standing in the next Rankings, hopefully achieving a more positive press coverage in the future.

In 2015 the sustainability consultancy Brite Green published 'The University Carbon Progress Report,' which showed that absolute carbon emissions for the higher education sector had increased for the first time since 2010. Furthermore, the report projected that higher education institutions will only achieve a 12% reduction in absolute carbon emissions by 2020, instead of the 43% commitment made in the Climate Change Act of 2008. One hundred and twenty seven UK universities were included and only three were found to be on track to meet their carbon reduction targets, whilst twenty eight were likely to exceed their targets. It was suggested that 'there is a clear tension between carbon performance and commercial growth and growth is winning out.' This latest report showed that Imperial College has reduced emissions by only 9% from 2005 to 2016 and is not on track to reach an emissions reduction target of 34% by 2020. Imperial was to the lower end of the rankings at no 107 (out of 126) in the absolute carbon reductions performance table from 2005-2016.

The Sustainability Tracking, Assessment & Rating System (STARS) is a transparent, self-reporting framework for colleges and universities globally (mainly US) to measure their sustainability performance. Established by The Association for the Advancement of Sustainability in Higher Education (AASHE) in 2007, it has over 900 members and examines seventeen sustainability impact areas. STARS participants submit data to earn bronze, silver, gold or platinum ratings. Imperial does not appear to participate in this scheme.

The UI Green Metric World University ranking is an initiative launched in 2010 by the University of Indonesia. Its aim is to develop a uniform system to rank universities globally, using a numerical score so quick comparisons can be made based on their commitments to addressing environmental and sustainability issues. In 2017, there were over 600 participants worldwide, with many from the UK (including The University of Oxford, Keele University and the University

of Sussex) but Imperial did not participate. Universities have to provide data and information for analysis. The greenest universities of 2017 were: University of Wageningen, Nottingham University and University of California, Davis.

Sustainability at Imperial College was examined by Maria Alepi, a Master's student at the Centre for Environmental Policy in 2017. Her thesis entitled 'Sustainability at Imperial College London: Benchmarking performance and best practice towards leadership,' concluded that Imperial College ranked very low regarding its sustainability performance compared to other world-class universities, especially in areas such as operations, leadership, community engagement and the failure to integrate sustainability into the wider academic curriculum.

Research here has demonstrated that many of our peers have embraced a deep commitment to advancing sustainability, which enhances rather than compromises their research and teaching. Among many others sustainability initiatives include:

- MIT which has had an office for sustainability for 10 years, developed 'living labs' and a 2015 'five-year Plan of Action on Climate Change'
- University of California's target to become carbon neutral by 2025
- UCL where the sustainability team has responsibility for paying energy bills and a mandate to reduce them, and openly reports on a range of ambitious environmental targets, such as a 15% carbon emissions reduction target by 2020
- Cambridge's £2million Building Efficiency Fund to which all staff/students can propose business plans
- King's College London which has over 75 sustainability champions across the College supported by the Facilities Team.

All the above raise serious concerns that we are lagging behind our peers in sustainability practices, vision and leadership. This arguably has the potential to damage our public and professional reputation as a global leader in technical progress, which could affect future funding and the quality of staff and student applicants.

There is much that can be learnt from our contemporaries. Common themes emerge that outline the requirements for universities to address effectively sustainability, environmental degradation and action on climate change. Successful universities have undertaken the following: developed strong internal sustainability leadership; introduced effective practices, policies and targets; committed to an enduring vision; provided a sustainability-focused curriculum and promoted and supported community campus engagement. Later sections will elaborate on all of these key themes and outline how the College can begin to incorporate them into its vision and mission.

The International Alliance of Research Universities (IARU) network is a collaboration between eleven leading universities (from five continents and including Oxford and Cambridge

universities from the UK) that has been developed as a resource for universities that want to address their environmental impact and develop best practices in environmental management. They have produced the 'Green Guide for Universities,' a practical authority of knowledge-sharing of key issues to address, recommendations and lessons-learned when making universities more sustainable. It is suggested that Imperial should consider joining the IARU for ongoing collaboration and knowledge exchange, to assist in its transition to a sustainable university.

Imperial is arguably failing in terms of sustainability compared to its peers, sitting in the bottom 10% of UK universities,[4] compared to its performance in the top 5% of UK universities in the Research Excellence Framework (REF) and leading in terms of teaching, with a Gold in the Teaching Excellence Framework (TEF).

Imperial arguably has the potential and opportunity to do better. This report will highlight areas for consideration in terms of contemporary sustainability performance, targets, initiatives and practices, with recommendations for improvements to advance sustainability within the College.

1.3.2 The Review Process and Main Findings

The study's recommendations were drawn from a variety of different consultation and research methods:

1. Survey across all staff and students, with about 850 responses
2. Focus groups (students, DoMs, building user groups, potential sustainability 'champions')
3. Interviews: Faculties, Campus Services, Estates, Student Union, Estates, ICT, Secretariat, Education and Research Offices, Friends of Imperial
4. Desk-based studies of existing courses, research and operational activities
5. 3 MSc projects to address particular issues
6. Contact with other institutions

A comprehensive online survey was launched in July 2017 to ask the Imperial College community their views on sustainability at the College. It was promoted widely amongst staff and students and was well received, with over 850 participants. The fundamental results from the survey are as follows:

The survey canvassed a very diverse community in the College. All departments and faculties were represented; all campuses had at least one respondent. Of staff respondents, over 50%

[4] People and Plant ranking; https://peopleandplanet.org/university-league

had worked at the College for longer than 5 years, and nearly 75% had experience in other institutions – this shows that staff care and have the potential understanding of good practice from elsewhere.

The community overwhelmingly feels more should be done by the College to tackle sustainability and climate change on campus, in our lecture theatres and in our operations.

- 98% think we should be acting on sustainability and climate change and doing more
- 98% think we should spend more money on sustainable infrastructure (existing buildings and White City)

Priorities of the respondents differed, but they were keen to engage and get involved in helping implement a potential sustainability strategy.

- Respondent priorities are: 1) Energy Generation and Consumption; 2) Waste and Recycling; 3) Built Environment and Building Efficiency.
- 395 respondents (65%) said they would like to be involved in future initiatives
- 195 left an email address to be contacted.

Many in the College community were dissatisfied that the College is doing so badly on a national platform.

- 91% are dissatisfied with our national performance in terms of sustainability (141st out of 151 universities in the 2017 Green League of Universities rankings)
- It should be noted that since then the College has fallen in the same rankings which was picked up by the College Union's Newspaper[5].

Respondents had a clear idea of who is responsible for sustainability, those at the top of the College. However, on a local level there was also no leadership.

- 85% felt Sustainability should be led by the President, Provost or a Sustainability Director.
- 17 individual responses suggested everyone in the College should have responsibility, whilst 13 suggested all those listed with the Greening Imperial Steering Group.
- Only 19% of Staff and 15% of students could identify a sustainability leader in their department or team.

The wider Imperial network are keen to engage with their own skills.

- 39 Alumni and Friends of Imperial indicated they are currently or have worked in sustainability – an example of the value they could bring to the College.

[5] http://felixonline.co.uk/articles/2017-11-17-imperial-sink-to-the-bottom-of-people-planet-s-ethical-league-tables/

The next findings concern the respondent's awareness of sustainability at Imperial College:

- 73% of respondents had either no idea or a bad understanding of what Imperial does in sustainability.
- 82% of respondents had no clue or a bad understanding of the College's current performance.
- 80% of respondents had no clue or a bad understanding of how their department performs in terms of sustainability.

All the above highlights disconnect between what the College is doing, and what the community understands the College is or should be doing. This is important with relation to communication in sustainability and in the College.

This reveals that Imperial's staff and students are passionate about and ardent supporters of improving sustainability at the College, with a huge appetite for more action on advancing sustainability and avoiding climate change. The survey, as well as a range of related one-to-one discussions and focus groups, revealed that we are doing a significant amount already, but activities are often uncoordinated, under resourced and that there is room for improvement in our own operations.

The priorities for action are energy consumption and generation, followed by waste and recycling, and then the built environment and building efficiency. Figure 1.1Figure 1.1: Sustainability priorities of the Imperial College community, identified by the Greening Imperial survey. below, shows the community's priorities.

Figure 1.1: Sustainability priorities of the Imperial College community, identified by the Greening Imperial survey.

Encouragingly, our survey revealed a keen desire for individual members of the College community to play an active part in developing and implementing future initiatives and solutions. We asked survey participants if they would be willing to play a more active role in the Greening Imperial programme or related actions, and over 390 people volunteered, covering all of Imperial's academic departments, as well as key professional roles.

The take home message from the consultations are that:

1. The community wants action to be taken,
2. Members are keen to be involved in that action,
3. They need leadership,
4. The College needs to support in terms of resources.

1.3.3 Opportunities for leadership in Sustainability and Climate Change

It is worth exploring where the potential lies to do more on the sustainability agenda, and what benefits come from increased focus and effort. Table 1.1 below considers the potential to become a true leading university, use our internal talents better, and grow in other ways.

Table 1.1: Sustainability and Action on Climate Change benefits for the College

	Operations	Education	Research	Impact
Where Imperial is currently leading	CHP and district heating plant Waste management and disposal	33 degree programs have sustainability as part of their existing curricula[6]	~£115 M grant income on projects related to sustainability[7]	Hosting national and international organisations and programmes: UKERC; IPCC; Climate-KIC;
Where we can lead in the future	Living Labs to use our campus as a test-bed and showcase for College research. Better waste management and energy efficiency. Cleaner environment and healthier staff.	Expand the Horizons course Increase the exposure and opportunity to learn for all students and staff. Increase accessibility to learning sustainability and climate change	Increase research funding as a minimum target in line with inflation. Continue to develop and deploy new ideas and technology.	Develop online and academic presence in this field, lead with MOOCs. Become a go-to resource of sustainability content for the public, industry and policy makers.

[6] From analysis undertaken of public information on the College website

[7] From analysis undertaken with Research Office Data

Parallels can be seen in how the College has managed to increase its capabilities with regards to supporting internal and wider innovation in STEM. Investments the College has made in creating the supporting infrastructure and frameworks required to facilitate innovation are beginning to pay off[8] and the world is beginning to take notice of the College's approach[9]. The same can be applied to action on sustainability and climate change, the only thing that Imperial is limited by is its ambition to succeed; and as our Imperial community knows too well, we have that in abundance.

Learning from others in this field, the opportunities and subsequent benefits for Imperial to lead in this field are summarised in Table 1.1 above.

The Sustainable Development Goals also present themselves as an opportunity to advance College expertise in sustainable development around the world, whilst working collaboratively to achieve those goals. Universities including Bristol have pledged their support to advance the SDGs in their institutions and a framework is developing around how best to lead SDG action[10].

1.4 Acknowledging Risk

Whilst there are great opportunities available for the College to become a leader on this agenda, it is important to acknowledge that risks exist. Table 1.2 outlines the risks involved in enhancing the College's sustainability offering. Each risk is described in the five areas where sustainability can be enhanced in the College.

In the *Suggested Solutions* section of this document, we propose a number of actions to promote Imperial's role as a leader on sustainability and climate change. These suggestions, including the option not to do anything, have associated risks.

These risks include regulations and initiatives[11]; reputation and community relations; costs and liabilities; health, safety and environment; competence gaps; unethical and irresponsible behaviour. However, offsetting these risks are the potential for financial gain; greater community standing; healthier working and studying environment; access to greater funding for research, teaching and learning; wider global and public impact; and opportunities to affect positive change in the culture of Imperial.

[8] https://www.imperialinnovations.co.uk/impact/

[9] https://www.timeshighereducation.com/student/news/top-100-most-innovative-universities-world-2017

[10] http://www.sdgaccord.org/

[11] https://www.gov.uk/government/consultations/leading-by-example-cutting-energy-bills-and-carbon-emissions-in-the-public-and-higher-education-sectors

Table 1.2: Risks associated with not doing anything in this field

	Governance	Operations	Education	Research	Support
Reputation Risks	Not an inclusive place to work; the community continues to feel isolated in their working environment Decisions are seen to be taken on cost rather than benefit to community	Playing catch up to government regulations; low cost rather than high quality services	The curricula remain dated; skills gap increases between students and employers' needs Top students will be drawn to more driven and in-touch universities	Key global challenge funders perceive the College to not take issues seriously Leading academics head to institutions encouraging greater research in sustainability	Not a supportive place for green/cleantech innovation for policy or industry. Partners move away from Imperial business offerings.
Cost Risks	Long term costs will increase as issues related to government directives require compliance to be met in a shorter time period	Costs of inputs to College will increase as no incentive to reduce and save will be identified; short term costs associated with services will decrease but quality and convenience is threatening benefits to the community;	It would be harder to charge highest rates of tuition fees when students study in an underperforming university	The cost to undertake research will increase which may price researchers at the College out of funding calls for grants and contracts	Diversified revenue streams from new and growing businesses may shift cost of the new campus onto Imperial departments
Benefits of stepping up	A more engaged and proactive College community that begins to tackle challenges and help in the delivery of College strategy	Increased efficiencies, saved money, gained income and talent from increasingly engaged student/staff populations	Tomorrow's leaders are attracted to attend. Curricula up to date outdated. Reputation enhanced.	Gain funding for existing and new areas, New expertise attracted to Imperial's growing capabilities, New expertise, new teaching related to exciting and future areas.	Imperial attracts investment and business, Our research begins to have more of an impact

2 Vision

2.1 Overall Vision

The Greening Imperial vision for the College is that:

> *"Imperial College London and its community will be leaders in sustainability and action on climate change at all levels and scales in society. Sustainability and action on climate change will be embedded into all of the College's activities including management of its sites, as well as education, research and wider impact activities."*

The current vision is guided and dependent on the College's overarching 2020 strategy:

> *".... of achieving enduring excellence in research and education in science, engineering, medicine and business for the benefit of society."*

Strategy 2015 – 2020, Imperial College London

This wider vision has been broken down below into visions for each of the main areas of action. These are outlined below. To achieve our vision, we will propose an action plan, along with indicators to help measure progress and identify success. This can be found in Action Plan – Recommendations section of this document.

Delivery of the action plan and vision will depend on effective communication within Imperial, working between existing departments to improve awareness of the research and activities that are taking place within this scope. Interdisciplinarity, as well as closer working between researchers and professional staff can generate relevant questions and directly applicable answers. This agenda can also be used as a way to encourage staff and students to work more closely together, enabling students to have greater societal engagement and directly influence sustainability practices on campus, for example.

2.2 Operations

The Greening Imperial vision for operations is that:

> *"Sustainability and climate change considerations will be comprehensively incorporated into estates management, improving our day-to-day relationship with the environment. In parallel, a rounded and comprehensive decision-making approach will be used in the College to ensure all of its projects include considerations of the potential to enhance the environment."*

The operations section includes specific objectives on a number of relevant themes:

- Energy and Carbon
- Waste and resources
- Water
- Construction and Refurbishment
- Procurement and Purchasing
- Sustainable Food
- Emissions and discharges
- Transport and Travel
- Biodiversity, Urban Landscapes and Ecosystems
- Divestment

2.3 Governance

The Greening Imperial vision for governance of sustainability and climate change is that:

> *"Leadership for action on sustainability and climate change at Imperial comes from the highest possible level, with a firm place for sustainability in the overarching governance structure e.g. Vice Provost level. This leadership is accompanied by a budget, and willingness to spend money in a way that takes a long-term view of investments. The College Community is widely engaged in action on climate change and sustainability, working in partnership with each other and with this high-level leadership."*

2.4 Education

The Greening Imperial vision for education for sustainability is that:

> *"All students will have sustainability, climate change and the environment integrated into their curricula; when they graduate, they enter society with a basic skillset to understand and contribute to these global challenges. Similarly, training for professional staff informs and enables staff to have a positive impact on the environment."*

2.5 Research

The Greening Imperial Vision for research is that:

> *"The College provides research and thought leadership in the global challenge field of sustainability and climate change to generate deeper understanding, solutions and technology towards a zero-carbon world and enhanced natural environment."*

2.6 Impact

The Greening Imperial vision for impact is that:

> *"Imperial shares information, technologies, innovations and capability with different audiences to enable stakeholders to tackle climate change and sustainability more effectively – be it at a government policy level or at an individual organisational level. The College establishes relationships and networks to enhance this impact and is a go-to institution for greater understanding of this field."*

3 Governance Structures

3.1 Introduction

Sustainability leadership is about creating a shared vision, building capacity, empowering and inspiring others, facilitating change and leading by example. Universities are in a strong position to give substance and credibility to what is sometimes an ill-defined and confusing concept, opening up a wider discussion. Through harnessing innovation and creativity, universities can demonstrate sustainability to the outside world. By making a strong commitment to sustainability, Imperial would encompass the principles of inclusivity, integrity, stewardship and transparency, as well as upholding the highest standards of governance and ethics.

Overseeing its key functions and processes through College leadership, determines how the College and its community fulfils its mission. The College lacks clear strong leadership in sustainability. Without an explicit vision; lead or champion; sustainability team; or specific resources to support the College community to practice sustainability the College cannot enhance its sustainability offering[12]. The College's lack of a sustainability strategy and governance has stifled community contributions from one of the most proactive and competent academic, professional and alumni networks in the UK and worldwide.

Evidence supports a restructuring of how sustainability and action on climate change is dealt with in the College, from first-hand practitioners to the College Community itself[13]. In particular the key elements are: sustainability being central to College strategy and Policy; high-level advocate; a clear vision, targets and action plans; and the resources to support action delivery and a sustainability network. Without these aspects, financial decisions taken at this high-level, which impact all aspects of College and community life, are unlikely to make the most of any associated sustainability opportunity.

Sustainability and Environment nominally come under the remit of the Health, Safety and Environment (HSE) Committee but the main focus in this committee is safety, with little profile given to environmental work as such. This section outlines the challenges with the current governance structure, opportunities to overcome these structural barriers and suggestions on the next steps.

[12] Evidence from consultations with sustainability teams from other HE Institutions

[13] Findings from the consultations with members of the community and sustainability experts

3.2 College Policy and Strategy

The College Strategy, and associated policies, lay the foundations for what the College expects in terms of its own mission and the actions and responsibilities of its community. At the moment, the absence of a strong policy on sustainability and the environment means that critical documents fail to take these areas into consideration adequately.

Examples include:

- Value for Money Principles
- Ethics Code
- Health and Safety (and Environment) Policy Statement
- College Fixed Assets Register

These policies, procedures and forms are all critical aspects of the College's priorities and operational approach. Although the College's Strategy 2015-2020 alludes to sustainability and action on climate change in terms of our research, it does not mandate or empower the community to take action on these fronts internally in our operations, our courses and our culture.

In contrast, some of our peer institutions like LSE, King's College London and UCL have made sustainability an integral part of their strategy and a pillar of their current and future plans for research, education, supporting external partners (governments and industry) to do the same, or internalising these capabilities to benefit the immediate College community. Not only is this a missed opportunity for Imperial, it erodes our competitive position and our aspiration to be the leading London university, especially on matters relating to engineering and the quality of life.

The absence of sustainability issues from Imperial's Strategy 2015-2020 has resulted in the College community feeling disenfranchised and powerless around sustainability matters. This lost narrative and message is the unintended consequence of a lack of leadership in this area, of clarity related to College policy, and a severely reduced incentive for the College community to engage and proactively participate in improving the College's performance in terms of sustainability, the environment and action on climate change. Consequently, addressing the lack of leadership on sustainability and its integration into the College strategy is arguably a high priority area for change.

Selected quotes from Imperial's Strategy 2015-2020 illustrate how this area is referred to only obliquely, with a focus mainly on research outputs and innovation, rather than as an operational core value which pervades culture and behaviour at Imperial. The emphasis is on

changing the world rather than leading by example and transforming ourselves at the same time:

> *"There will be new approaches to dealing with epidemics, shortages of natural resources and environmental crises. New challenges will arise." [p3]*
>
> *"They are also drawn from other looming challenges such as the need for secure, sustainable water, energy and minerals; the impact of environmental and climate change; and the corrosion of materials in our vast, ageing civil infrastructure." [p4]*
>
> *"Engineering expertise is increasingly important for addressing global health and well-being challenges, with the development of new devices and techniques helping to restore the quality of life of patients at a sustainable cost." [p13]*
>
> *"We aim to drive innovation to create a more sustainable world for future generations." [p14]*
>
> *"What if we could quantify and mitigate the impact of environmental and climate change?" [p14]*
>
> *"What if we could deliver water, energy and minerals that are secure, sustainable and affordable?" [p14]*
>
> *"We aim to improve the health of all in society in the UK and worldwide. This requires both the creation and improvement of treatments and prevention strategies, and the delivery of high quality, low cost, sustainable healthcare." [p15]*
>
> *"What if we could recover heat energy and store it for later use?" [p15]*
>
> *"What if we could manage our environment in real time using advanced sensors and data analytics?" [p15]*
>
> *"What if we could develop a carbon negative built environment?" [p15]*
>
> *"What if we could create business models that lead to further investment in renewable energy?" [p15]*
>
> *"We will substantially increase our involvement in advising governments and industries on key policy areas such as science and innovation, education, health, energy and the environment, using alumni relationships, professional contacts and opportunities to bring key decision makers to the College" [p27]*

3.3 Leadership

There is currently no identifiable leader on sustainability within the College at a senior level. Providing this leadership is crucial to sustainability being taken seriously at all levels throughout the University. Studies consistently point towards the power of positive leadership in changing the organisational culture of any company or institution[14]. Having sustainability incorporated into an existing leadership role, or the remit of a new role, would add gravitas to the agenda and pass a strong message that action in this area at all levels is encouraged and empowered. Such a sustainability champion would be responsible for:

- The creation and implementation of a sustainability-environment strategy to be adopted by the College
- To devise and implement an action plan to deliver the Strategy against agreed targets
- To create and nurture a 'Greening Imperial' culture and commitment amongst the College

3.3.1 Current structure

The current organisational structure relating to sustainability and environment activity within the College's operations is illustrated in Figure 3.1. Decisions are mainly directed through Estates and Facilities which allocates an annual budget of ~£600K for initiatives in this area. It is notable that four large segments of the community have no direct involvement in ensuring that Imperial's campuses and operations are sustainable (including students, academic staff, alumni and friends of Imperial), and that care of the environment is a cultural priority.

[14] Norton et al., 2016 Employee Green Behaviour and Aging (DOI 10.1007/978-981-287-080-3_308-1)

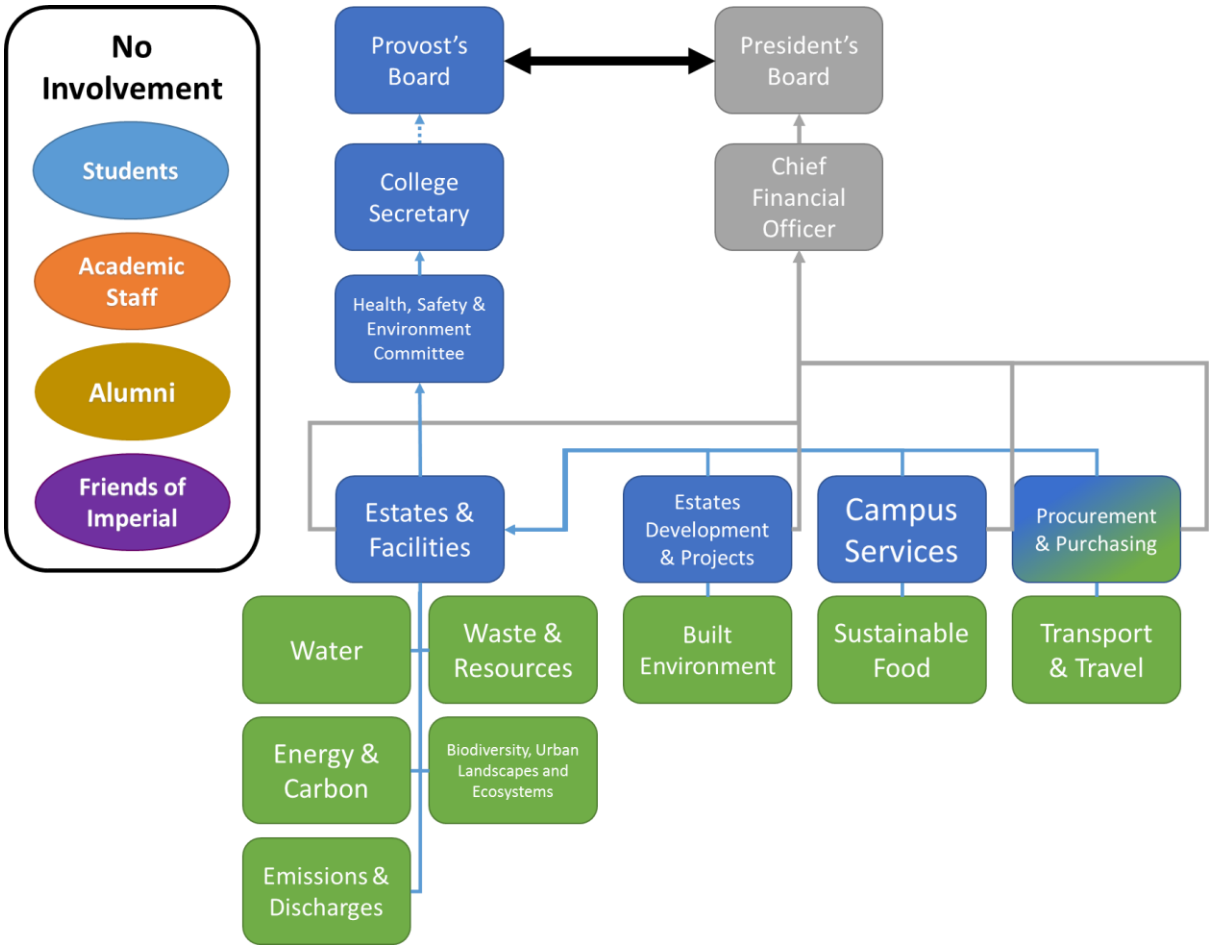

Figure 3.1: Current organisation relating to Sustainability and Environment. Decision making and reporting channels (in blue) and the financial channels (in grey). Items in green are aspects of sustainability that should be measured against target metrics. Items in blue are key teams currently with some responsibility for this area. Estates and Facilities plays a dominant role.

Sustainability issues of course are important not only for operations but also in the educational, research and translational mission of the College. No one person currently has oversight of even all the operational issues, let alone the broader context of mission delivery. The presence of a high-level sustainability 'champion' is crucial in providing oversight to how the College's major financial and operational decisions take sustainability into account.

3.4 Decision-Making

In line with observations about Imperial's Strategy and leadership, gaps have been identified in the way in which climate change and sustainability are incorporated into decision-making at the College. There was some evidence, through our survey, that proposed sustainability-related projects experienced a high failure rate primarily due to poor business case design and a lack

of understanding of the decision-making process, including a lack of awareness of previous programmes and projects.

The Greening Imperial survey demonstrated that the respondents would like to see Imperial make decisions about projects in a more sustainable and environmentally-conscious way as 97% said the College should do something about sustainability[15].

There are understandable concerns amongst some in the College community about the additional spend that may be required to advance sustainability practices. Trading off an increased capital expenditure does not immediately increase the whole life cost (or total expenditure) of projects; the payback period is usually extended.

There are various options for integrating sustainability concerns into decision-making that can be carried out in parallel, or together:

- More clarity of the decision-making process for projects, to encourage more relevant proposals, and ensure that legacy information is retained and can be referred to.
- Incorporate a sustainability appraisal into the line of decision-making for certain types of projects and processes (e.g. above a certain threshold), especially for procurement.
- Imperial should adopt a more holistic approach in decision-making on advancing sustainability across the College, encompassing all three of its principles – environmental, social and economic – instead of focusing mainly on the latter, which has tended to be the emphasis hitherto.
- Provide an explicit mandate from the College's senior leadership for staff to investigate alternative and/or more sustainable options (from alternatives to plastic cutlery to more efficient lasers).
- Project assessments, including consideration of different options, should undergo a full lifetime analysis of impact and costs (upfront capital and ongoing operating costs) with the potential for applicants to consider longer-term payback periods, and accounting for the benefits of environmental protection and/or enhancements appropriately. Such an analysis would help address concerns that 'financial sustainability' over a short timeframes conflicts with actual sustainability.
- Sustainability has to be considered, at a minimum, an option for all investments, making a sustainable option along with the lowest cost solution part of a rounded and comprehensive appraisal of options.
- Consider the criteria for stopping further investments in existing projects, where the sustainability approach is poor, in concert with clauses to not invest increased funds for projects that do not meet a set criterion, e.g. NPV, IRR and CBA assessments within a reasonably positive boundary compared to lowest cost.

[15] Findings from online survey

These small changes at a College level can make significant changes e.g. reducing waste streams associated with lower quality and disposable items[16]. If a university cannot take a longer-term perspective on costs and investments, who can?

3.4.1 Divestment

Divestment is a theme and issue that came up multiple times throughout the consultation from all areas of the College Community. Over 360 respondents would like to see Imperial go Fossil Free; over 40 explicitly mentioned in their further comments in the survey.

There is a growing global movement for fossil fuel divestment (the removal of investment capital from stocks, bonds or funds) calling on institutions to move their money out of oil, coal and gas companies, for both moral and financial reasons: fossil fuel divestment takes the fossil fuel industry to task for its culpability in the climate crisis.

The number of UK universities divesting from fossil fuels has grown rapidly in recent years, now with over sixty, including Oxford, London School of Economics and Kings College London leading the way. More recently in February and March 2018, Durham University, Edinburgh University and the University of Sussex have committed to divest from all fossil fuels.

Imperial College's Student Union began a Divestment Campaign in 2014. On their website, they claim that 'Imperial College London's endowment fund is investing heavily in fossil fuels. In 2016, Imperial College's direct investments in oil, coal and gas totaled over £5.4 million out of a £126 million endowment fund.' In meetings with previous divestment campaigns at Imperial many years ago, the College claimed to prefer to engage with companies as shareholders than to publicly denounce their actions.

On 8th October 2015, students of Imperial organized a successful debate around this issue, 'Divestment: what are the options.' However, after this time the campaign appeared to wither away.

Less than a year ago, Divest Imperial was formed, re-igniting the divestment campaign. A petition calling on the College to divest from fossil fuels received over 1700 signatures and Imperial College Union voted overwhelmingly to divest their own investment fund. However, recently at a meeting, the Chief Financial Officer at Imperial stated that he believed that while he agreed with the impact and causes of global warming that divestment was not the way to achieve a greener society as fossil fuel use is driven by demand. He prefers to use shareholder influence or activism through collaborative research and through the endowment board. In direct response to implementing divestment, he thinks making such a statement would damage the relationship with these companies, supposedly due to the aforementioned large

[16] Norton et al., 2015 Pro-Environmental Organisational Culture and Climate, Newgen

amount of research grants they provide to us and that is it better to engage with research rather than divest. He continued that the College "doesn't think it's immoral to receive funds" from these companies, and, when pressed, revealed that it believes that investing money in fossil fuel companies was actually a net positive for the climate.

In the 2017 Green League Table, People and Planet claim:

- Imperial invested £8,743,456 in fossil fuels, including £646,641 in ConocoPhillips, £642,420 in Glencore and £580,580 in Shell. This amounts to 1.9% of total endowment fund of £455,000,000.
- Imperial received £17,370,438 research funding from the fossil fuel industry, including BP and Shell.
- Since 2001, Imperial has received £68,847,215 research funding into the renewables industry.
- Between 2009-2014 Imperial received £23,987,851 in donations from the fossil fuel industry, including, Shell, BP, Statoil and Total.

It is unclear as to how this information was gathered but it does show that Imperial relies heavily on research donations from the fossil fuel industry, despite research efforts to develop/improve renewable energies for the future.

The Oxford Martin School has recently developed a set of new principles to guide corporate investment towards climate goals, which should help Imperial address the moral challenge of climate change and investments.

3.4.2 Communication

Visible, clear and effective communication at Imperial is essential to building a sustainable campus, leading to a greater awareness and understanding of environmental issues and improved integration of sustainable practices. Communication is important at all levels, but critically from the top with the overarching message and vision. This also demonstrates the strong commitment of Imperial College to ongoing sustainability goals and creating a cultural change amongst the community. Imperial has a diverse community and strong, effective dialogue and communication is necessary for collective change.

Communication must be authentic, clear and empowering, to help build enthusiasm, motivation and trust, as well as to generate action. Transparency and accountability are essential. Messages need to be inspiring, desirable, fun and persuasive, emphasising the advantages and benefits of sustainability. It is important to continually update highlights, improvements and successes in sustainability.

Strong, effective communication to Management is also necessary to emphasise the benefits and co-benefits (short and long term) in investing in improved sustainable practices across campus. These might include, inter alia, greater resource efficiency and associated cost savings as well as better health and productivity for staff and students.

No system has been identified for staff and students to ask questions or make suggestions about sustainability at Imperial. As previously mentioned, before the Greening Imperial activity the college did not have a section on the website exclusively for sustainability. This poor communication has impacted the ability of the community to understand the College's current standing and has undoubtedly contributed to Imperial's poor performance in the Green Rankings League. Many other universities, for example Harvard, have a clear, visible and informative section for sustainability on their websites. The recommended Assistant Provost for Sustainability could be responsible for communication of sustainability goals and achievements, an annual sustainability report, as well as upgrading/establishing the sustainability/environment section on Imperial's website.

3.5 Campus Community Engagement

Fostering a culture of environmental awareness throughout the campus community is vital for the ongoing improvements in sustainability at Imperial. A vibrant and engaged community at Imperial will provide a rich resource for envisioning, mobilising and instigating change.

This will need inertia to carry it successfully through the continuous turnover of students as well as integrating coordinated action between the various individual Departments.

Our College-wide consultation revealed how different members of the Imperial community could play an active role in creating and delivering a Greener Imperial. Many staff and students who wish to make a difference, currently feel inhibited or at least not encouraged. Research here identified a scarcity of sustainability engagement across campus. Apart from the Student Union Environment Society (which appears to have a very small membership) no networks, workshops, initiatives or campaigns have been identified across the campus.

Table 3.1 below describes challenges that have been experienced by members of the College community, as well as proposing solutions.

Table 3.1: Barriers and solutions to engage the wider Imperial community in Greening activities

Community segment	Opportunity	Barriers	Solutions
Student	Has time and motivation	Lack of awareness of activities or potential collaborators, framework to get involved	Communicate successes and areas of opportunity; Raise sustainability up the agenda and in policy; Create structure for involvement; Coordinate College activities
Academic Staff	Has niche and world leading expertise	Lack of mandate, awareness of activities or potential collaborators and time	Raise sustainability up the agenda and in policy; Communicate successes and areas of opportunity; Create structure for involvement; Make connections with professional staff and students to help with lack of time.
Professional Staff	Has internal experience and process insights	Lack of mandate and time	Raise sustainability up agenda and in policy; Provide extra capacity and support;
Alumni	Has keen interest, outside experience, complementary skills Potential donor.	Lake of awareness of opportunities and framework to get involved	Communicate successes and areas of opportunity; Create network for involvement; Coordinate College activities
Friend of Imperial	Has keen interest and potential donor and/or connections.	Lake of awareness and framework to get involved	Communicate successes and areas of opportunity; Create network for involvement; Coordinate College activities

Designating a range of internal champions for climate change and sustainability could help create a network within the Imperial Community. Figure 3 shows that Imperial currently has just one Sustainability Champion (Professor) whereas comparable universities have 50-150. The survey revealed at least 395 potential Imperial Sustainability Champions; the challenge is to harness their enthusiasm and empower them to bring their ideas to fruition.

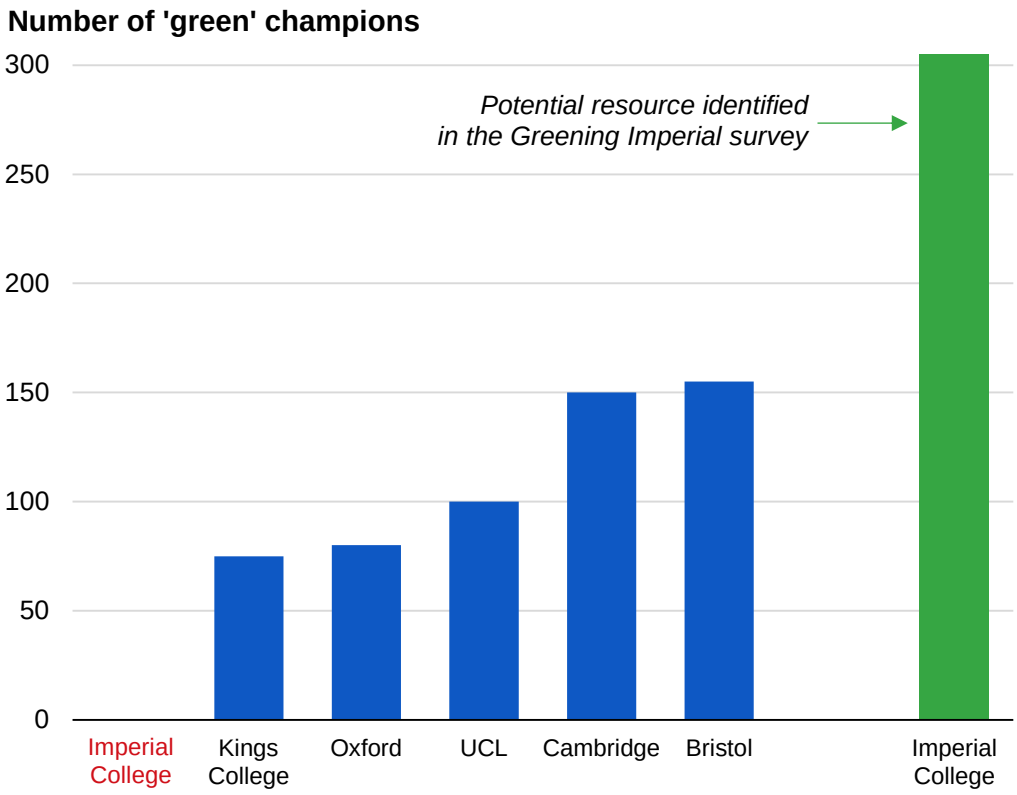

Figure 3.2: Number of 'Green Champions' at Imperial College and its peers

The Greening Imperial survey identified a strong willingness and desire amongst the College community to engage in advancing sustainability practices campus-wide and beyond. Imperial has the opportunity to create cultures of sustainability for its staff and students, setting expectations for how they envisage the world and future. Graduates from Imperial would be responsible citizens with a broad knowledge of how sustainability is applicable to their chosen field and how their behaviours affect the world around them. They can take a leadership role by advancing global understanding of sustainability, developing strategic partnerships and implementing best practice to reduce ecological degradation. This will all add to the reputation of Imperial.

Student and staff motivation has been successfully stimulated at other global universities by introducing certification programmes, sustainability awards and sustainability summits/events.

3.5.1 Comments from the Community

Below are selected quotes that were taken from the online survey as part of the consultation with the College community. They are pertinent in particular with the governance section.

Students

"Empowering people with what they can do to help the environment"

"It's nice to see the college seeking the student opinion on the environment"

"Thank you for creating this survey! Please keep people informed about what you're doing. The more people are aware that things are happening, the more they will be willing to do their part :)"

"Imperial should communicate its position on the matter and have students engage more with forward path"

Academic Staff

"I'm delighted this topic is now on the College's agenda."

"If you need an advocate in the St Mary's building I would be happy helping out!"

"This aspect needs to be part, and priority of the College Strategy"

"Please do something about this. I'm ashamed to work at a university that's supposed to pioneer sustainability but are this bad at practicing what they preach."

Professional Staff

"This feels long overdue. I joined ICL 4 years ago from another, smaller, RG university and was frankly shocked at what I perceived to be a total lack of consideration for sustainability and action on climate change. I quickly learned not to question the processes in place or voice my thoughts on the matter - my perception has sadly not changed. I hope this survey is a sign of changes to come."

"Our poor engagement with our own sustainability carries a reputational risk that could undermine our academic work on sustainability and climate change. we need to practice what we preach. Conversely, if we were to become a class leader in sustainability and climate change we should be able to leverage this as a market advantage in attracting further academic work in this area."

"I have worked at the College for 20 years and this is the first time my comments have been asked for. In my view its a bit too late".

Alumni and friends of Imperial

"This is a big step forward from 5 years ago"

"All actions should be monitored and should be communicated to students and staff and posted around campus"

"I recall having examined syllabuses of courses there. And being aghast to find how little commitment appeared therein to say making London sustainable!"

"I really was surprised Imperial was ranked so low for sustainability, such a progressive institution should be leading from the front!"

"I am very pleased that you are addressing these issues, as they have bothered me for some time. I am very happy to get involved and help."

3.6 The way forward

As outlined above, Imperial needs to incorporate leadership for sustainability action at the highest levels of governance, accompanied by a suite of measures to inform and empower grass roots activity by staff, students, alumni and partners. This section sets out how such a system could operate.

3.6.1 Step 1: Develop a policy

The first stage is to incorporate sustainability and action on climate change into the College strategy. This strategic objective should be supported by a Policy statement and relevant policy documentation. Once in place, all members of the College would have a responsibility to comply with the environmental policy and a duty to contribute to its implementation in their own areas.

3.6.2 Step 2: Set up appropriate sustainability positions

We proposed that the College models the leadership approach for sustainability and action on climate change on the approach that has been used to integrate Equality, Diversity and Inclusion into College policy. This includes the creation of the post of Assistant Provost for Sustainability (APS) who acts as a leader at the Provost Board level. This part-time post should be supported by a Sustainability (Greening Imperial) Leadership Group, made up of the main stakeholders across the College, to create collective ownership of action on sustainability and climate change.

The APS reports directly to the Provost, with whom ultimate responsibility for sustainability policy resides. He/she is responsible for incorporating and embedding sustainability into the College Strategy and developing an appropriate Sustainability and Action on Climate Change Policy, approved by the Provost Board. The APS is responsible for implementing this Policy by drawing up a rolling three-year plan, in line with the pillars of activity identified in the Vision statements in Section 2. Projects would be funded through the appropriate budget-holder (e.g. Education, Research, Estates…) through the annual planning round. The APS would attend Provost Board meetings on a regular basis to report on progress of the Plan, to seek

appropriate approvals and to respond to proactive suggestions or questions from other senior leaders in the College.

The APS should be supported in their role by a Sustainability (Greening Imperial) Leadership Group, with representation from College top management for the following key areas: Operations, Education, Research, Policy (and Influence) and Outreach. This group provides leadership, takes ownership of sustainability initiatives and decides on priorities and targets. A possible composition of this Board is:

- Vice-Provost Education
- Vice-Provost Research
- Head of Building Operations
- Co-Director of Grantham Institute (Policy and Influence)
- Associate Provost Academic Partnerships
- Student Union Environment Officer

The management and practical implementation of the working plan and policy lies with key individuals that have been outlined in the specific sections of this report or identified by the APS. Their actions are supported and coordinated by the APS, who should work closely with all teams across College to enable progress in achieving the targets and realising the vision.

3.6.3 Step 3: Mobilise the community

In parallel with this top down approach, the APS should create an environment that fosters and encourages grass roots initiatives and supports them wherever they arise. A Sustainability Champions Network, or similar, could be established to empower the College community to enhance their local working environments and improve sustainability in their workplace. As volunteers, they are ultimately coordinated and supported by the APS but he/she will be assisted in this role by a Sustainability Champions Network Coordinator (SCNC). This person will operate from the Grantham Institute to identify, support and encourage these grass roots activities.

Together, the APS and network coordinator will carry out a range of tasks for, and with the community:

- Assist with coordination between different activities and initiatives, making links and connections where it will be helpful;
- Create communication internally to aid awareness of challenges and activities;
- Help maintain the momentum of activities both top down and bottom up
- Create a mechanism whereby individuals and teams, including Departments and Institutes, can propose initiatives and seek support to implement them.

- Investigate and map the sources of funding for sustainability initiatives (across all pillars) and provide advice to those who need it.
- Create a network or forum comprised of the champions of these grass root activities and meet regularly to discuss initiatives, their progress and ways to cross-fertilise them, spread best practice etc.

The current *ad hoc* Sustainability and Action on Climate Change Group, who instigated the Greening Imperial initiative, will migrate to an (expanded) Sustainability Advisory Panel who will assist the APS and SCNC in encouraging grass roots activity and linking it up with larger College initiatives, including the Centre for CleanTech Innovation, if it comes to fruition.

The organisation related to Imperial Sustainability activity within this proposed model is illustrated in Figure 3.3 below.

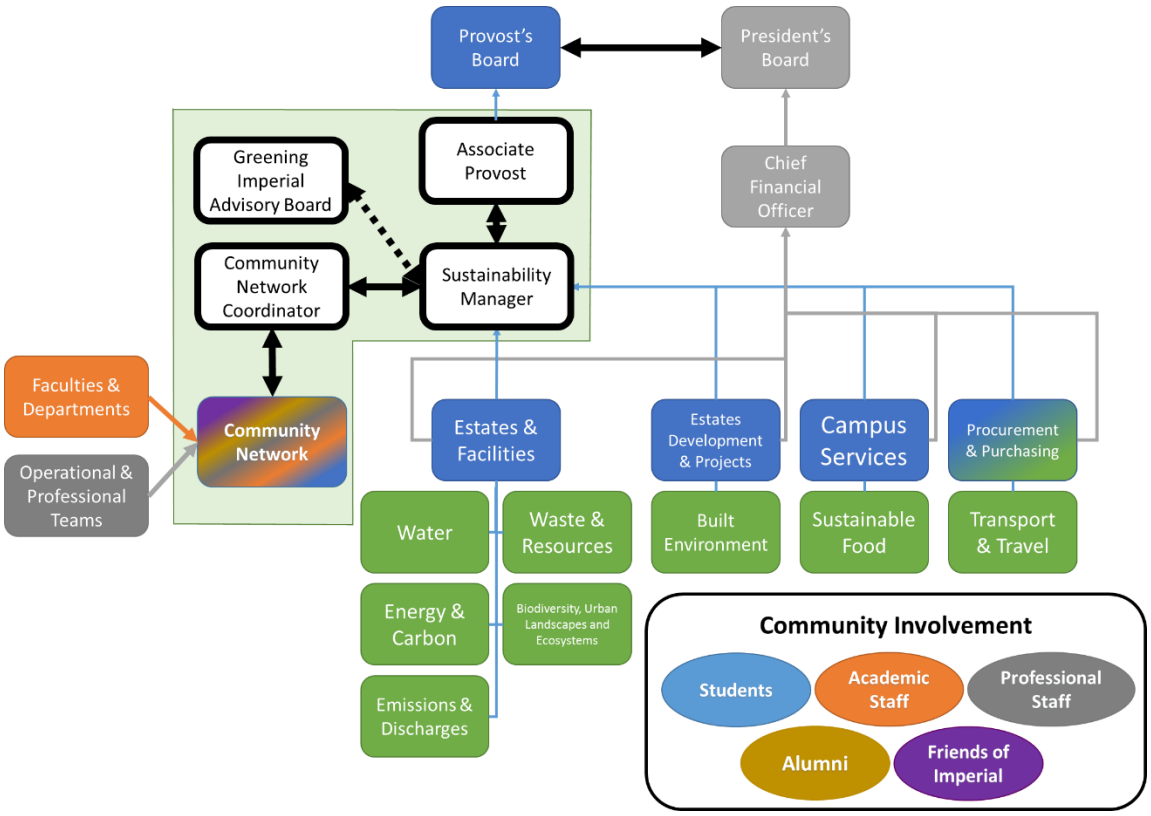

Figure 3.3: Suggested decision-making and reporting channels for sustainability. In blue are the practicing teams with their sustainability responsibilities in green. The grey channels show financial decision making. The black shapes and links show the new relationship between the Imperial community and existing channels for sustainability in the College.

The reporting channel will link the Assistant Provost Sustainability (i.e. primary face of sustainability within the College) with the Provost, the Provost's Board and the Sustainability

Board, a sub-committee of the Provost's Board. Here a direct channel to the main funding mechanism is created on top of priority area insights as to how sustainability could be incorporated into all other aspects of the Imperial offering.

3.7 Resources

Figure 3.4 indicates that Imperial spends a significantly lower proportion of its utilities spend on energy and environment projects than comparable UK institutions. To implement improvements in sustainability and climate change action, the College will need to dedicate both financial and non-financial resources to support and sustain real change throughout the College in Greening Imperial. It will be the role of the APS to identify priority areas for such funding.

Many of these projects could become self-funded through, for example, energy savings or markets for waste resources. Including longer time horizons in the cost benefit analyses, as suggested earlier, could help make these savings more apparent. This area is also attractive for philanthropic giving and Advancement could offer some support in pitching appropriate sustainability projects to donors. In the Operations section, a table outlines existing possible sources to fund some of these sustainability projects.

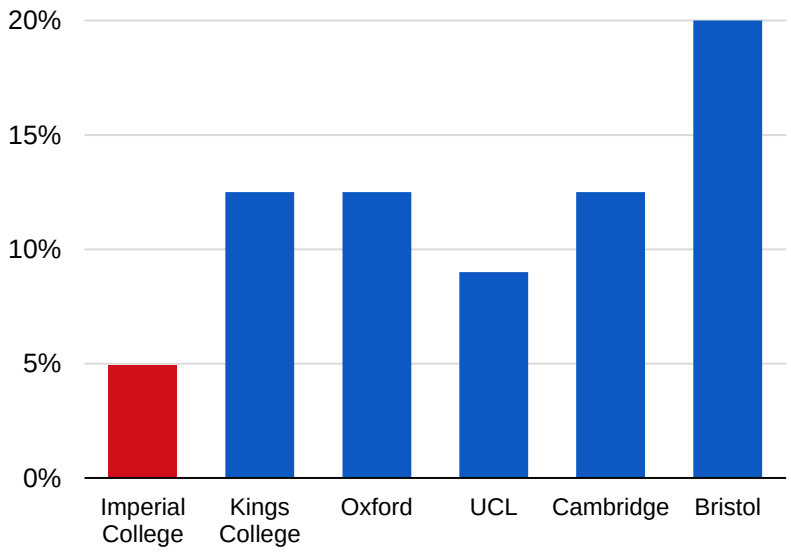

Figure 3.4: Spend on energy and environment projects as a share of total utilities spend.

4 Operations

4.1 Introduction and Drivers

Our poor performance in the 2017 People & Planet Green League of Universities (see Context and Drivers) is based almost solely on environmental management, with only one dimension on education. Our own student population (97%)[17] believe sustainability and action on climate change should be addressed by the College and (98%) think the College should do more. The corresponding for all members of staff (professional and academic) is 98%.

To become a global leader in sustainability and to continue to be an attractive place to work and study, Imperial arguably needs to get its own house in order.

Becoming a world leader in sustainability is only one of a number of drivers for the College to improve sustainability in its Operations. Others include:

- Financial savings;
- Benefits to education, research and wider support;
- Reputation; and
- Mitigating risk exposure to external drivers.

Many Higher Education institutions in the UK and globally have been able to improve the sustainability of their operations whilst not only preserving the quality of their education and research but enhancing it. We have the ability to learn from a variety of both market leaders (University of Nottingham, University of Brighton) and our equivalents in terms of size and mission (MIT, University of Cambridge). Good practice has already been established in sustainability and action on climate change and this section will begin to outline how this can be done at Imperial.

This section focuses on the Operational aspects of the College. This chapter covers how the College uses and manages resources like water, food and energy; how the college creates and disposes of waste and environmental discharges; how the College uses and manages its assets like the natural and built environment; and how the College deploys its finance to ensure service or material provision is done in a sustainable and efficient manner (travel and purchasing). This section includes targets, ownership and the resources required.

[17] From Greening Imperial Online Survey

4.2 Government and Funding Authorities

Top-down pressures from Government complement the College community's signals for action. The UK has signed up to the international Sustainable Development Goals (SDGs), which make commitments to environmental targets ranging from clean water through to biodiversity. On SDG 17, action on Climate, the UK's Climate Change Act (2008) commits to reducing emissions by 80% against a 1990 baseline by 2050. The government has outlined a greenhouse gas emission reduction trajectory for the public estate and HE institutions. The 2017 Clean Growth Strategy[18] includes plans to introduce voluntary HE targets of 30% reductions in GHG emissions by 2020/21 against a 2009/2010 baseline, with further reductions by 2030. The recent 25 Year Environment Plan includes targets to reduce waste from plastics and in 2019 the College will be impacted by the extension of the Waste Electrical and Electronic Equipment Regulations to cover a wider range of products.

Over the period 2009–2016, the UK's national emissions have fallen 23%[19] . Figure 4.1 below shows the College's rising greenhouse gas emissions over this same period, and future scenario and targets. Planned as voluntary targets, these might become mandatory[20] once the reporting framework is in place. Even if they remain voluntary, there will be a reputational risk associated with failing to meet these objectives.

By 2030, Imperial would need to achieve a 60% reduction in emissions relative to its current trajectory to adhere to these government targets.

[18] https://www.gov.uk/government/publications/clean-growth-strategy

[19] https://tinyurl.com/beis-uk-ghg-2016p

[20] From Green Growth Plan

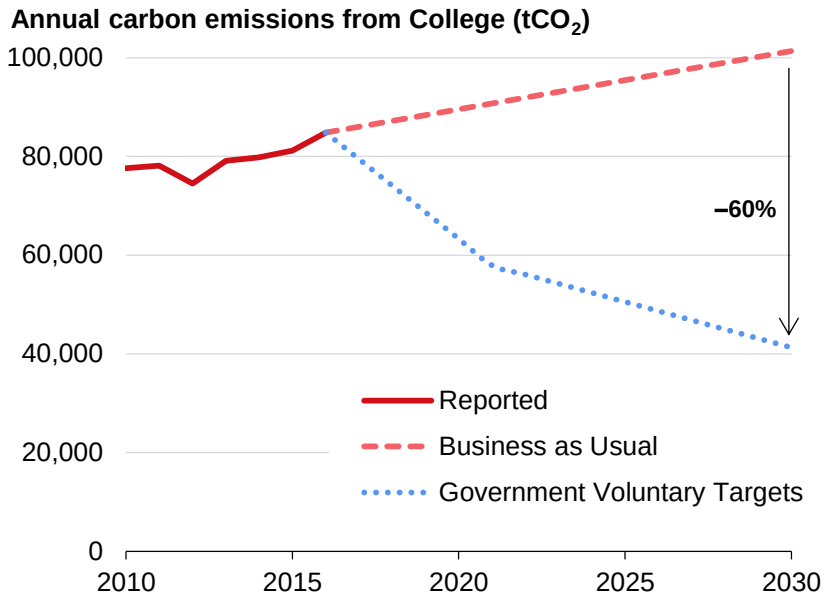

Figure 4.1: Imperial's carbon emissions and future targets, according to the Clean Growth Strategy. Business as usual is an extrapolation of average emission growth this decade; which is compared to the emissions trajectory that meets the Government's proposed voluntary emissions targets.

The Higher Education Funding Council for England (HEFCE), now part of the Office of Students, have directed the movement of English HE institutions to become more sustainable. In the past HEFCE have attempted to restrict university spending based on their sustainability; although this idea was not implemented, it is an example of how quickly and from which sources these policy drivers can emerge[21].

4.3 Imperial's Current Standing

This section describes the Colleges current track record across a wide range of sustainability issues. Although we do not perform as well as other universities on these metrics, our internal professional staff undertake their activities with great competency and to a very high standard. However, their job is not to follow or implement a sustainability plan, but rather to meet legal obligations on resource use, energy and construction standards, and financial salience.

4.3.1 The Operational Team

The College has historically had a piecemeal approach to sustainability in operations, it is spread amongst a number of teams working in different directorates (see Figure 4.2). Although great work, collaboration and enthusiasm is achieved amongst the different teams (Estates and Facilities, Estates Development and Projects, Campus Services, and Purchasing and

[21] http://www.hefce.ac.uk/funding/finsustain/Projects/aisa/

Procurement), it has been difficult in the past to ensure all teams employ a more joined-up approach in their sustainability work. This is due to the absence of frameworks or policy being in place to encourage and facilitate such action. Other barriers to further action on sustainability include capacity constraints in teams, budgeting approaches and competing projects and priorities in each directorate.

Figure 4.2 shows a disconnect between the financial decision-making at Imperial and the environmental decision-making. The Health, Safety and Environment Committee could offer a platform for more scrutiny of sustainability activity, but at the moment this committee focusses predominantly on the safety aspect of its remit and is merely the last stop for report on sustainability. This committee does not have any funding responsibilities or powers. As a result, there is no effective, over-arching part of the Imperial governance structure that provides external advice or oversight checking the progress of current College targets and ambition.

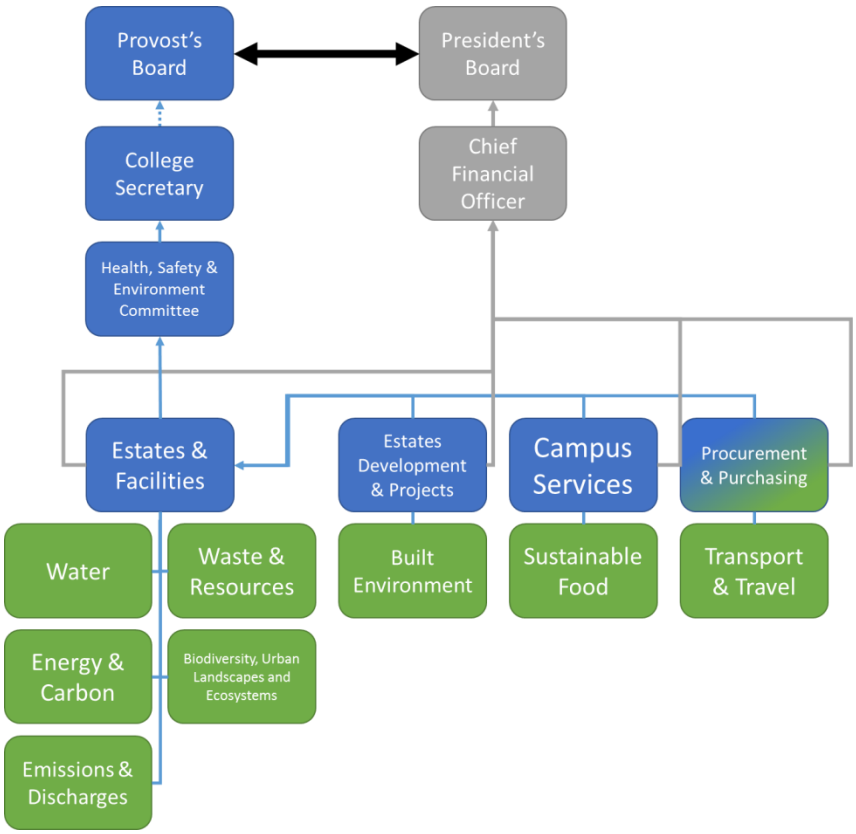

Figure 4.2: Current operational management relevant to sustainability. Financial (grey) and evaluation (blue) mechanism for College sustainability and environmental performance.

The Estates facilities team are responsible for the management of the College's land and buildings, which includes energy, water and waste management. Their mission is 'to provide quality environments, in which teaching and research can thrive and to do so in a way which is

efficient and sustainable.' It has an ongoing commitment to reduce the College's environmental impact.

Imperial's Energy and Environment Improvement Fund is housed in the Estates and Facilities department. This team also has an energy efficiency budget which is decided by appropriate and experienced members of staff with oversight of what needs to be done, and what can be achieved (£600,000).

The College is in the process of implementing an environmental management system (EMS), using the EcoCampus EMS system. The aim is to achieve higher ISO14001 Environmental Management accreditation, currently at the silver level (but could be at the platinum level).

4.3.2 Operational Targets and Monitoring Progress

Imperial College's Environmental Policy commits to the protection of the local, regional and global environments by developing policies and procedures around the management of:

- Reducing waste sent to landfill – Reduce Reuse Recycle hierarchy
- Reducing pollution
- Reducing effect on local ecology and biodiversity
- Reducing the environmental and other aspects of transport
- Being responsible for the effect of the College supply chain
- Initiate active community involvement
- Reducing water consumption
- Reducing energy consumption and CO_2 emissions- Combined heat and power plant

However, with no sustainability strategy, it is unclear as to how these policies are translated into practice. No clear targets for environmental goals exist and reporting of relevant data and achievements is poor, or non-existent.

The College's teams are responsible for the sustainability (quantity, quality and management) of a much broader set of areas than those were action is specifically mandated:

- Energy and carbon;
- Emissions and Discharges;
- Water;
- Waste and Resources;
- Biodiversity, Urban Landscapes and Ecosystems;
- the Built Environment;
- Food;

- Transport and Travel; and
- Purchasing (procurement).

Regulation and good practice recommends monitoring for most, if not all, of these areas[22]. The College uses Key Performance Indicators (KPIs) which normalise metrics against dynamic variables like total community population, size of the estate and financial expenditure. The College's current KPIs are:

1. Electricity consumption per capita (kWh / person)
2. Greenhouse gas emissions per unit of internal floor area (tCO_2-eq / m^2)
3. Greenhouse gas emissions per million pounds of expenditure (tCO_2-eq / £m)

These KPIs have their merits, however, Government sustainability targets require absolute reductions in impacts and so these relative measures might prove insufficient.

Imperial should adopt a wider range of sustainability targets and objectives that align to government targets and metrics whilst maintaining the listed KPIs above to communicate internal sustainability to departments and community members. These targets should be commensurate with provisional government guidelines: 30% reductions against a 2008/09 baseline to be met by 2020/21; a 50% reduction against a 2008/09 baseline to be met by 2030.

4.4 Improving the sustainability of our operations

The College engaged with HEFCE's low carbon reduction programme 2009-2014 and the Carbon Trust's Carbon Management programme. This programme has now ended and so there is less impetus behind carbon management activities at College.

The College has previously tried to undertake other sustainability initiatives which have had limited success due to a lack of community buy-in and continued engagement. A lack of ownership at senior level and poor visibility of the programs are possible reasons for failure. Internal communications have been a challenge in the area of sustainability as stakeholders and participants have to be engaged and aware of their actions to be fully active. Sustaining action and awareness is also typically difficult.

[22] http://www.legislation.gov.uk/uksi/2016/1245/contents/made

A range of smaller activities, or anecdotal experiences, indicates where the challenges and opportunities lie with sustained engagement and action, and can also be the source of frustration to the College community.

- ***Communications campaigns:*** The Step Up programme included napkins saying we want to cut CO_2 by 10%; screensavers informing us to turn our computers off overnight as well as posters in the Senior Common Room commenting on how many "basketballs worth of food" we have wasted.
- ***Temperature control:*** The immediate environment, and inability to control these in a comfortable and environmentally-friendly manner is a source of frustration to colleagues, particularly when extreme indoor temperatures occur in the centres of internal sustainability advocacy e.g. the Grantham Institute, Centre for Environmental Policy.
- ***Large capital projects:*** Some innovative ideas have been explored but are then not always progressed. For example, a borehole system was investigated for the wider 1851 estate with partners across the South Kensington-Exhibition Road neighbourhood. Potential for a productive ground source heat pump was identified but not progressed due to concerns about finance and timescale.[23]
- ***Existing examples of sustainable processes:*** Imperial has made a strong commitment to some sustainability infrastructure. These include a composting facility the recent installation in 2016 of a new combined heat and power (CHP) plant. One the largest of its kind in central London, the plant generates electricity on site and captures the majority of waste heat to warm buildings, produce hot water and generate steam for autoclave facilities. This should deliver 75% of the campus's electricity and significantly reduce carbon emissions on the Kensington site (data not yet available). However, the CHP plant uses natural gas: by continuing to use this fossil fuel Imperial will impede transition to a zero-carbon future and mitigating its part in climate change.

These activities can be used as a starting point to consider the types of individual operational activities that can be successful. An example of this approach was a MSc thesis exploring how behaviour change can be encouraged on College campus related to waste[24]. This section now explores Imperial's track record on sustainability across all of the main relevant operational categories and considers what targets and actions could be appropriate in the future.

[23] From interviews during the consultation.

[24] Joshi, M. Exploring methods of best practice to influence and sustain pro-environmental or sustainable behaviours, 2017 MSc Thesis

4.4.1 Energy and Carbon

The College estate is vast and due to the nature of our research work, very energy intensive, with a combination of old and new buildings. With the addition of the White City campus the estate continues to expand year on year. Against this background some efforts have been made to reduce carbon emissions and improve energy efficiency, as shown in Figure 4.3, the demand for electricity has risen slightly. There are no targets or commitments to reducing carbon emissions or to transition to a zero-carbon future.

Figure 4.3 College electricity usage per capita has increased 15% over the last four years

kWh electricity per capita			
2013/2014	**2014/2015**	**2015/2016**	**2016/2017**
4,926	5,474	5,337	5,645

To achieve carbon reductions, Imperial has largely pursued energy efficiency programmes[25]. Although greater use of renewable energy is an aspiration of the College there has been a limited rolling out renewable energy on estates due to these projects taking too long to payback their initial investment[26].

The College continues to implement the 'Controls Optimisation' programme, which was initiated following the 2009 Carbon Management Plan. This approach has garnered critical acclaim[27]. This involves reviewing the operations of buildings that have been occupied for some time and re-commissioning/optimising the building energy management controls to reflect the operation of the building in its current mode of use. An in-depth audit highlights opportunity where modifications can be made to ventilation systems, chillers and boiler units, inter alia, to improve energy performance of buildings. Additionally, over the last five years, the Energy and Environment team have been rolling out LED lighting retrofit projects across the College. It is estimated to provide an energy saving of 52%.

The College continues to invest in state of the art 'smart metering systems,' which enable real time energy to be assessed in buildings. Data collected allows for anomalies and patterns to be identified and investigate changes that adversely impact energy use. Data analyse allows investment opportunities to be prioritised. The Estates team are in the process of making this data accessible to the wider College community to enable members to investigate and drill down into meter-level monitored sustainability data. Allowing greater access to this primary data can facilitate research into Imperial-centred problems associated with the estate.

[25] http://www.imperial.ac.uk/estates-facilities/sustainability/environmental-policy/reducing-energy-consumption-emissions/

[26] From interviews with members of staff

[27] http://www.imperial.ac.uk/estates-facilities/sustainability/efficiency-monitoring-reducing/building-efficiency/

Increasing accessibility to information creates awareness of problems and invites solutions, like reduction in energy use[28].

Recommendations:

- To commit to specific, timely and ambitious targets for energy and carbon emission reductions
- Re-consider and assess opportunities to install renewable energy technologies, to aid in transition to a zero-carbon future

4.4.2 Water

As it stands, the College has no policy on water usage or consumption. This limits the ability for the College to act on aspects of sustainability and the SDGs. Drinking water is found across College though more can be done to sign post this[29]. Waste water is of critical importance to the College due to the nature of its work and waste streams. Although solid, chemical and health waste is dealt with very effectively (see waste section), it is unclear whether the College community is supported to deal and treat waste water or drain-waste as comprehensively. Considering the importance of the resource to College functions, education and pertinently the research it undertakes; the College needs to act proactively in this area.

Recommendations:

- Improved reporting of current practices.
- Alternatives to potable water should be used wherever possible, such as rain water harvesting or on-site recycling of water for irrigation or toilet flushing.
- Community Programmes to promote behaviour change such as taking shorter showers.
- Incorporation of research into existing and new campuses.

4.4.3 Waste and Resources

Imperial follows the principles of the 'waste hierarchy, favouring reuse over recycling, recycling over energy recovery and recovery over disposal (landfill.) In 2016, the only waste sent to landfill was healthcare waste, being 11% of the total waste produced.

All general waste is sent for energy recovery. Food waste from the campus catering outlets and food waste bins in the halls of residence is composted, eventually being used on the College's flower beds as a natural soil improver.

[28] https://www.kcl.ac.uk/sspp/departments/geography/study/masters/dissertations/PGTDissertation-2014-SustCities-Saima-Iqbal.pdf

[29] http://www.imperial.ac.uk/estates-facilities/buildings/facilities/drinking-water/

Various reuse initiatives are in place:

- 'Warp It' is a redistribution network, that facilitates reuse of unwanted items
- 'Student Departures Reuse and Recycling' campaign, partnered with the British Heart Foundation.
- Food donations to the homeless charity 'Emmaus.'

An opportunity lies with general and healthcare waste reductions to be increased as it currently makes up the majority of waste emissions. This could be investigated by the research community with medical equipment, design engineering and sustainable materials all being research here.

4.4.4 Biodiversity, Urban Landscapes and Ecosystems

The College's estates cover a large area in both rural and urban settings. Coordination of a landscape and biodiversity management strategy across all campuses has not been developed with current resources which is a large area of opportunity for conservation and pollution benefits. There is no central oversight of the biodiversity on campus via a mapping exercise or monitoring; these are knowledge gaps that the community can begin to fill with projects and initiatives in this area. The Student Union Environment Society (ESoc) manages the bee hives in the secret garden as a great example of current community involvement, and similar initiatives can be supported further by others in the community and the College.

The Estates Facilities team[30] consider the local habitats for plants and greenery around the College. The compost for the planters originates from the College's own composter and food waste; this is another great example of where the College already implements circular thinking in its operations. However, this can be expanded as not all food waste is composted and there are large unnatural surfaces (roofs, courts, roads, walkways) that are devoid or nature or plants. With a large urban estate, the College can encourage research in 'greening imperial' with blue-green infrastructure, green walls and roofs[31] and aesthetic and health benefits of an enhanced natural presence on College campuses.

Recommendations:

- Planting more trees could create 'breeze corridors' reducing the energy demand for air conditioning (protecting against the urban heat island effect,) creating a more aesthetic

[30] Sustainability Report 2016 Update

[31] http://www.imperial.ac.uk/media/imperial-college/faculty-of-engineering/civil/public/ug/ug-final-year-projects/2015-16/F04---Yuan-Huo.pdf and http://www.imperial.ac.uk/media/imperial-college/faculty-of-engineering/civil/public/ug/ug-final-year-projects/E17---Barry-Au.pdf

environment (leading to increased wellness and productivity in staff and students,) sequestering carbon emissions and improving air quality.

- Map biodiversity on campus.
- Employ a landscape maintenance company to advice on how to maximise benefit from Imperial's limited space.
- Increase the number of green roofs, to protect against flooding.
- Harvest rain water, which can be used to irrigate vegetation.
- Invest in a living green walls[32]
- Utilise and enhance natural resources like the Secret Garden. Increase the number of bee hives and opportunities for staff and students to be involved in their management; plant herb and vegetable gardens whereby the produce can be used in the catering facilities.
- Encourage staff and students to become stewards of campus open space.

4.4.5 Built & Digital Environment

Imperial College has a building portfolio of a varied selection of old and new buildings, with wide-ranging functions. This can be challenging when adhering to building regulations and upgrades/retrofits can be difficult and expensive to implement.

Sustainable construction can reduce the resources used in the building which includes energy, water and carbon used for heating, cooling, lighting and ICT. However, Imperial has established low carbon standards for new buildings, retrofits and has developed strategies to achieve these. However due to cost engineering and minimisation, retrofits and new builds often meet these standards and require subsequent ex-ante work to improve the building's sustainability operations and reduce running costs[33].

RIBA project stages of commissioning buildings are followed; but greater comprehensive option appraisal is required to outline the benefits of sustainable construction projects to those taking the investment decisions. It is imperative to understand occupant behaviour and the unique requirements of each building (laboratories, lecture theatres, offices etc) when considering design and optimising building performance[34]. Greater information of benefits and costs, coupled with targets and aims for new constructions, provide the drivers for investment in sustainable construction, motivation. However, there is potential to go further, especially during retrofit and new build stages. Indeed, Imperial could become a leader in showing what can be achieved and demonstrating new technical solutions. Together with external partners

[32] https://www.scotscape.net/

[33] From interviews with members of staff.

[34] Truong, T. Decision making in higher education building retrofit. 2017 MSc Thesis

like White City project contractors, the College and its community should collaborate to improve the built and digital environment services available for the years to come.

Recommendations:

- Greater involvement of College community, campus and building user groups beyond operational staff.
- Low carbon and environmentally friendly considerations central to plans for any development.
- Consult and investigate the potential for College innovations to be implemented in new or refurbished buildings

4.4.6 Sustainable Food

There are several catering outlets on campus for the staff and students; but little diversity in their management due to the majority falling under one catering contract. When using these, there only limited information (leaflets, posters etc.) available as to how sustainably the food is sourced.[35] However, after much effort searching the website, a small sub-section was found with the relevant information.

The College does have a sustainable food policy, which claims to use locally sourced, seasonal food/ingredients. However, there is no information as to where these products are sourced from. Fairtrade certified products are purchased where available and it is ensured that no fish from the marine Conservation Society (MCS) "Fish to Avoid List' is served. All of which is excellent practice but this information is not clear and visible to the customers. Imperial supports the sustainability campaigns of One Water, London on Tap and Sustainable Fish Cities.

Promoting the sustainability of the food at Imperial may also make the College more attractive to the general public, who may be looking to book an event, thus generating more revenue for the College. There are members of the catering staff who have expressed their support in making food sourcing more sustainable.

Campus Services and catering have been supportive of student initiatives in the past, in particular of sustainability research associated with their operations. Studies are currently looking into nudge theory impacting the sales of vegetarian options served; and studies have

[35] https://workspace.imperial.ac.uk/eatinganddrinking/Public/Sustainable%20Food%20Policy%202015.pdf

been done internally and with collaborators looking at food waste and behaviour change[36], and taxing plastic cups[37].

Recommendations:

- Reduce the consumption of ruminant meat (beef and lamb.) Consider Meat free Mondays across the campus.
- Promote the consumption of vegetarian and vegan foods.
- Purchase Fairtrade certified products where possible, ensuring ethical, fairer trading conditions and opportunities for small scale farmers in developing countries to invest in their businesses and communities for a sustainable future.
- Only serve sustainable seafood, adhering to the MCS Good Fish Guide.
- Ensure animal welfare standards are adhered to and insist on Red Tractor certification.

4.4.7 Transport and Travel

Transport accounts for a significant and growing share of Imperial's carbon footprint. A major contributor is road transport due to commuters, goods deliveries and college vehicles. These cause local environmental problems including air pollution, noise and congestion. Car parking at Imperial uses considerable and valuable space that could be utilised for a more beneficial purpose (such as green spaces for staff and students to enjoy.)

With an increasing demand for international collaboration and knowledge sharing, international flights contribute to a growing share of carbon emissions at Imperial. As the College wishes to grow globally, greater thought needs to be applied in how the College enables its community to travel sustainably where possible and necessary.

Imperial has made strides in reducing the environmental damage by local transport. This has been done by facilitating cycle use by increasing its cycle storage facilities, cycle to work scheme, providing updated maintenance facilities and opening a small workshop; the college now has four electric car charge points, to encourage the use of electric vehicles and has a successful car club in operation; Imperial offers interest-free loans for staff to purchase season travel tickets.

Recommendations:

- Campaigns to promote cycling and walking.
- Phase in electric fleet vehicles.

[36] Joshi, M. Exploring methods of best practice to influence and sustain pro-environmental or sustainable behaviours, 2017 MSc Thesis

[37] Speak to J.morris@Imperial.ac.uk for the Bewley's Plastic Cup study

- Promote video conferencing to reduce the amount of travel required.
- Automatic carbon offsetting for international flights.

With the latter point, rather than rely on individuals to do this, Imperial should monitor and record all international travel and offer a combined offsetting initiative, such as buying and protecting areas of rainforest in the Amazon or Indonesia. This should also have the co-benefit of improving Imperial's public profile; and if the scheme were mandatory, it would increase the cost of flying relative to alternatives. However, it must be carefully considered so as not to disincentivize individuals from taking alternatives to flying, by feeling as though flying were now the sustainable option.

4.4.8 Procurement and Purchasing

Imperial procures a wide variety of goods and services across departments and teams. Regardless of aspect, there can always be a sustainability appraisal of goods and services over a threshold of cost. Currently, purchasing guidelines do not specify or encourage sustainability appraisal in the procurement of goods or services. Value for money is seen through a cost minimisation approach[38].

Adopting purchasing and operational practices that are commensurate with good sustainable purchasing technics and the sustainable development goals can generate value elsewhere in College, like health and well-being. For sustainability, 'green purchasing' is recommended, as this not only considers the entire lifecycle of the product (supply chain and disposal) which can lead to a substantial reduction in costs but also demonstrates environmental leadership.

Many of the catering outlets on campus use plastic disposable cutlery and single-use coffee cups, which are neither compostable or recyclable. In recent months, several different student groups at Imperial have come forward, being critical of this practice and demanding the eradication of these cups and cutlery from the campus. Many leading organisations are now banning single-use plastics from their operations. Recently in February 2018, the BBC revealed that it plans to eradicate single-use plastics completely by the end of 2019. In September 2016, France passed a new law to ensure all plastic cups, cutlery and plates can be composted and are made of biologically-sourced materials by 2020.

Although efforts on recycling have handled the plastic waste streams generated in the College, more can be done to remove the creation of plastic waste. This report is critical of the support of One Water, as the water is contained in single use plastic bottles. Imperial is proud of this relationship, as 100% of the profits are donated to clean-water products in Africa. It is argued

[38] https://www.imperial.ac.uk/media/imperial-college/administration-and-support-services/purchasing/internal/VALUE-FOR-MONEY-PRINCIPLES.pdf

here that the good achieved in Africa as a result of the sale of One Water is by far outstripped by the damage the single use plastic bottles are causing globally. There is an escalating global momentum to eradicate single-use plastic bottles, especially after the recent BBC series Blue Planet II, which highlighted this pollution, the devastating consequences and pervasive damage caused by plastic to the marine environment. The United Nations Environment Programme (UNEP) launched an unprecedented global campaign to eliminate major sources of marine litter, including single use plastic in 2017.[39] Imperial would be demonstrating strong environmental leadership by signing up to this campaign and banning single use plastic from the campus (catering outlets and shops.) Alternatives from bottled water to furniture exist.

Recommendations:

- Ban single-use plastic from campus and purchase alternatives that are biodegradable and compostable http://www.biopac.co.uk;
- Increase the number of and accessibility of drinking water stations/fountains on campus. Make these locations more prominent on the website/posters around campus;
- Ban procurements that contribute to rainforest destruction eg palm oil (and its derivatives);
- Increase communication, visibility and education about this sustainability commitment;
- Improve transparency of supply chains;
- Engage in community food projects.

4.5 Challenges and opportunities in Operations

The main challenges that exist in Operations relate to limited resources, lack of a mandate and constrained capacity in the current team structure to implement sustainability ideas across Imperials campus's. Here, we propose some overarching actions that will support the delivery of operational sustainability and highlight some opportunity areas.

4.5.1 Living labs scheme

The development of a framework, and potential fund, to support the prototyping and testing of innovative, sustainability-enhancing technology and processes on the College's campus could contribute to this agenda. A living labs scheme could encourage the implementation of some

[39] https://www.unenvironment.org/news-and-stories/press-release/un-declares-war-ocean-plastic

operational investments on the basis of multiple criteria like data value to research and enhanced sustainability rather than solely cost over a short time period.

Success in these schemes has led to greater engagement with campus communities around the world from MIT to Deflt. These initiatives trial out sustainable urban drainage, biodiesel fuel processing, solar feasibility of neighbourhoods and real-time monitoring of green labs to name a few[40].

4.5.2 Funding for sustainability investments

It is important to have a means of paying for some sustainability actions and interventions. As outlined in the Governance section, it is important that decisions about operational investments include metrics that account for sustainability benefits, as well as economic considerations.

The use of competitions and funding rounds has already been established across other HE institutions as potential mechanisms to share sustainability funds within college. This fund could potentially be used for operational projects as well as on-campus research projects, or a requirement to both improve operations and enhance College sustainability at the same time.

[40] https://sustainability.mit.edu/living-labs

Table 4.1: Sources of funding available to HE institutions to enhance their sustainability and action on Climate Change.

Criteria	Limitations	Benefits
College funding › Energy and carbon		
Projects submitted to the improvements fund have to meet CBA, NPV and IRR targets set by the College	It is currently the only fund able to invest in improvements across the whole of College. This money comes from direct College funds (competitive)	Fully controllable in terms of spend.
Advancement Funding › All aspects		
Needs to be determined by the senior champion (Assistant Provost with the support of the Provost's Board) and with the advice of advancement. Recommendation for it to be designated for research-deployment orientated projects.	No control over the income year-on-year. Requires understanding of the donors to enhance the benefit delivery to them.	Relatively flexible in application. Not attached to other aspects of College spending.
Salix funds › Energy and carbon		
HE institution based energy improvement scheme.	Constrained to energy saving projects in the built environment.	Interest-Free Government Loans; Money is non-competitive internally to the College. Loan repayments recovered from energy savings (no extra spend).
RE:FiT › Energy and carbon		
London based energy efficiency improvement measures on London Public Buildings	Only London campuses allowed; public buildings only	Guaranteed to not cost more than if the scheme wasn't accessed.
ESRC-IAA › All aspects		
Explicitly for developing innovative forms of knowledge exchange in research; developing relationships with stakeholders and engagement;	Constrained on topic aspect (how content is developed than what). Maximum £20,000	Opportunities to lead in sustainability engagement, communication and design

4.5.3 Communication and Engagement Campaigns

Support and resources for sustainability are not exclusively financial. Many other HE institutions, public and private sector organisations work together to share best practice and knowledge when it comes to delivering positive changes related to sustainability and action on climate change. Membership of these networks (see below) can add a lot of value for the College in this area as the College will move straight to tried and tested methods for enhancing the sustainability and action on climate change across teams and campuses.

EAUC

The Environment Association for Universities and Colleges (EAUC) is registered charity that works to enhance the sustainability of member universities and colleges. College used to be a member of this network, but because we did not use it often, this was seen as unnecessary spend that led to the College's withdrawal. For a fee of around £2,000 per year, the College can re-join the EAUC network and access good practice from others in the field. Most UK universities also participate in this network including: LSE, University of Edinburgh, Cambridge, Oxford, UCL and the University of Manchester.

NUS Green Impact

The NUS Green Impact is an initiative that is administered by the National Union of Students (NUS) but is a bespoke service that they operate for fees separate from NUS membership, which Imperial is not a member. Other members include: UCL, Oxford, Cambridge, Edinburgh and Manchester. Imperial College has in the past taken part in this scheme, but due to changing priorities in leadership, Green Impact was not continued[41]. This option still exists as NUS membership is not a prerequisite for Green Impact participation.

ISCN

The International Sustainable Campus Network is a network of universities across the globe that collaborate and share knowledge meant to enhance campus life and its sustainability. Members include MIT, Yale, Eindhoven, TU Delft, ETH Zurich, Tsinghua and Melbourne.

While networks outside the university can be helpful, networks within the university are equally so. These networks can help disseminate good practice and get individuals and departments to think critically about their wider impact on sustainability. It is a mechanism to engender support in the outlining of the agenda and delivering the strategy.

[41] From interviews with members of staff.

Sustainability Champion Network

It is often cited that capacity to enact change in the operational context is limited. This is due to a limited scope of delivery and resources directed at statutory requirements the College is obligated to meet and some deficits of key skills which includes behavioural change and network management. Voluntary networks is a great way of supporting coordinated action and community building across all segments of the College community. The College has had step-change ambassadors in the past (as part of a wider sustainability drive), but these failed to make an impact due to it being under resourced[42].

Other HE institutions already have established and growing sustainability networks that save money, carbon and increase collaborative action across College. Currently the College has no student, staff or any other volunteers related to sustainability that it supports; all sustainability actions are executed by individuals primarily because they want to act in a sustainable way. Because of this, many activities go unnoticed by the College. A sustainability champion network can allow skilled and motivated members of the community to participate in the College's health and wellbeing[43]. Schemes in UCL, King's College and MIT have brought change to their campuses and sustainability performance. See the Governance Structures section for more ideas on how to structure integrate this internal community within a wider College sustainability framework.

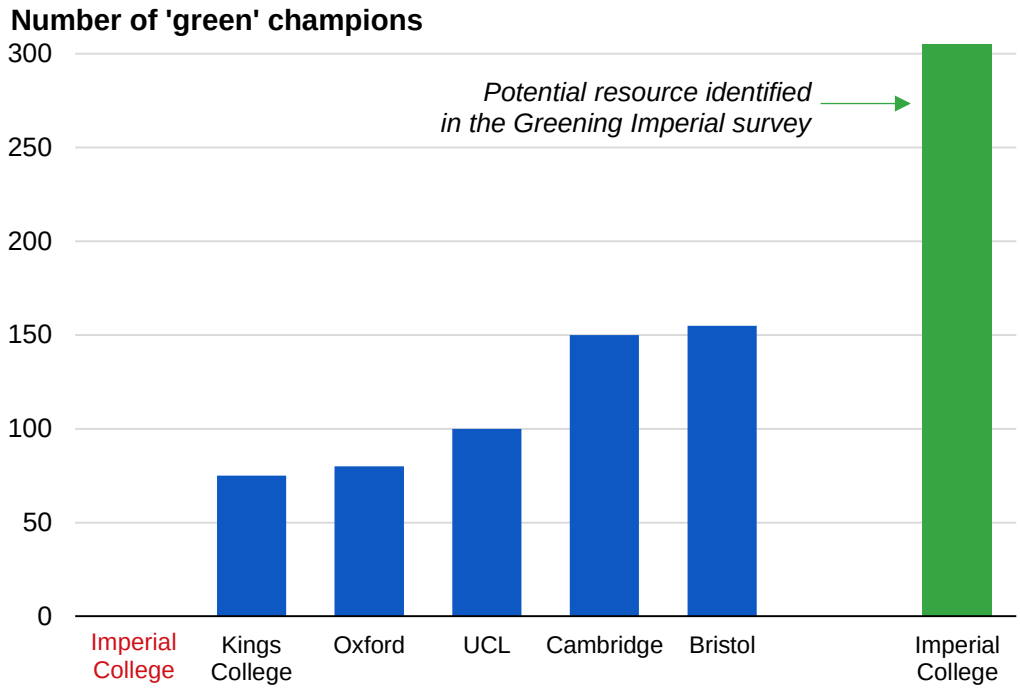

Figure 4.4: Number of 'Green Champions' at Imperial College and its peers

[42] From interviews with members of staff.

[43] https://www.hrzone.com/lead/change/make-change-sustainable-with-change-champions and interviews with external sustainability experts.

5 Education

5.1 Teaching and Learning Content

The College teaches many different kinds of students, from undergraduates through to professional education and wider adult learning. The College attracts some of the greatest minds to both study and teach here from around the world. With this comes a responsibility to not just teach leaders, but also 21st century global challenges, including sustainability and climate change.

5.2 Current sustainability and climate change education at Imperial

5.2.1 Undergraduate Courses

SACC related programmes at undergraduate level are virtually all elective which means that a student can progress through their degree without ever having to critically think about their actions on the environment, society or the economy. Although some courses have aspects of sustainability built into their curricula, the clear majority do not only 5 out of 30 undergraduate courses have these elements (insert footnote: 30 is the number of fundamental course curricula that other bespoke courses are developed around).

We would like to expose students to ideas and skills that inspire them to pursue research in innovative areas, whether it be further postgraduate education, undergraduate research projects, or through working in an industrial, commercial or politics.

The Horizons Programme is an elective suite of course open to all undergraduates. Only some departments take their credits into account for the student's assessment or have requirements for students to complete and pass a minimum of courses. The Global Challenge module includes material on climate change, the environment and sustainability, but this is limited in scope due to broad range of topics covered.

In 2017 this module did not take place due to a lack of demand from students. It is important to understand the reasons why, including the way in which different options compete with each other, so that we can optimise the way we share information about sustainability and climate change with undergraduates during these formative years.

Examples of undergraduate courses with sustainability taught elements include:

- Chemical Engineering
- Ecology and Environmental Biology
- Physics

5.2.2 Postgraduate taught Courses

Imperial has a sizeable proportion of postgraduate students and a wide offering of sustainability and climate change related and orientated courses (28 bespoke MSc courses). Taught postgraduate degrees can be found in 11 of 36 departments and centres in the College. Although better than the undergraduate provision, there are still many postgraduate students who don't get any sustainability or climate change input into their courses at all. Importantly, the quality of the teaching at this level is very high, with departments receiving awards for their programme and the quality of their teaching.

Examples of Postgraduate taught courses leading in this field include:

- MSc in Environmental Technology
- Innovation Design Engineering (MA/MSc)
- MSc courses in Civil and Environmental Engineering
- MSc Climate Change, Management and Finance
- MSc in Conservation Science

5.2.3 Postgraduate Research

The postgraduate research community (PhDs) is extensive and broad, and this is one of the areas where education and research mix constructively. Other than undertaking research, PhDs in the College are commonly found helping to deliver teaching, supervision and outreach events which enhances what the College can provide and share with students.

Examples of PhD programmes orientated towards sustainability include:

- Science and Solutions for a Changing Planet DTP
- EPSRC CDT in Sustainable Civil Engineering

5.2.4 Adult and digital learning with skills development

There are a variety of training programmes for professional staff. These often take the form of courses in the science communication unit, however they are tailored to skills-based

development like music and languages rather than being content specific. Some of these training sessions, however, are compulsory, including health & safety training, which is obligatory for new joiners, and more specific HSE courses and practices in departments. There could be an opportunity to expand this type of training slightly to include messages about environmental behaviour and opportunities.

The Graduate School offers a variety of training courses of postgraduate researchers, which could be extended to include, or incorporate climate change and sustainability further. The current focus is on skills.

5.2.5 Outreach to the wider public

The College takes pride in not just teaching Imperial students, but it also proactively engages in public events, public seminars and courses on offer to the wider community.

Imperial has a programme of other courses that it offers, including Continuous Professional Development (CPD) for external audiences. In the past, there was a CPD course on climate change, and on environmental law. The CPD department has been very supportive of efforts to consider setting up these programmes again, should the format be appropriate, add value to existing options, and if there is sufficient faculty to lead such a course. In 2017, the Grantham Institute worked with the CPD department to see if it the CPD courses on these topics should be reintroduced. It has been decided to proceed with a digital course (MOOC) in the first instance.

Imperial has recently hired a new Director of Digital Learning and, together with the Grantham Insitute and funded by an external donation from the Children's Investment Fund Foundation, this team is setting up a Digital Academy on Climate Change, with a focus on decarbonisation of the power sector. The Business School is also preparing a MOOC on climate finance, with a focus on financial disclosures on climate change, which will complement the Digital Academy on Climate Change.

Other universities already provide sustainability and climate change orientated public courses in the forms of Massive Open Online Courses (MOOC). MIT, Cambridge, Harvard, and other companies like Google offer learning to the masses via accessible and free courses.

Imperial also plays an excellent part in engaging with wider society through public engagements events like the Imperial Festival, Imperial Fringe events, Science Museum Lates, Natural History Museum Science Uncovered and many others. There is also a costed piece of infrastructure in terms of the development of ‘Stadium House’ at the White City campus; providing the opportunity to hold events to engage the public with case studies of good sustainability projects. The Invention Rooms and Maker space at Stadium House creates the possibility of building innovation and sustainability solutions together with the public. We could also pro-actively spread our work on new technology, energy efficiency and best practice

into schools and community settings directly. We should assess the extent to which these public engagement activities already addresses sustainability issues and how this could/should be expanded. We intend to do so in close conversation with Professor Maggie Dallman.

5.3 Enhancing our Teaching Offering

Whilst there is already excellent activity taking place that brings together education and sustainability and climate change, there is scope to do more. The ideas below have been developed to approach specific barriers to further education on climate change and the environment.

5.3.1 Objectives for education and sustainability at Imperial

There are two broad categories where we think the education around these topics can be enhanced: 1) research related to the discipline that tackles their specific sustainability challenges (like public health and water quality; or extreme events on futures markets; or low emission technologies); 2) critical thinking in terms of practicing their knowledge in a sustainable way (like the impact of concrete structures on the local environments and low energy laser technology).

In students…

Engendering a sense of ownership over these problems associated with sustainability, the environment and climate change helps students and their networks think more critically about how they operate. Having courses on how to incorporate sustainability, environmental and ethical considerations helps the student have a deeper understanding of the impacts of their actions.

There are various ways this can be achieved, the primary way for teaching and learning to be provided at the College is via the student's host department. Here the degree programmes managers and coordinators take responsibility with lecturers in their field to design curricula for undergraduate and taught postgraduate degrees. However, as identified earlier, this broader knowledge can also be provided by the Horizons program for undergraduates. This could be expanded to incorporate taught postgraduates too.

The Imperial Innovations Enterprise lab is another example where students can be taught new skills and content related to a specific topic (business and enterprise). However these skillsets can be combined with sustainability. This was exemplified in the Innovating for Sustainable Development course on the SSCP DTP and the Cross-CDT Dragons Den.

In staff…

For other members of the Imperial Community to learn additional content and skills, a different approach is required. The graduate school already helps develop soft skills for postgraduate research students and a similar case is also true for post docs, early career researchers and new academic staff. Some additional content related skills could be provided by the grad school tailored to critical thinking of environment and sustainability impact in their discipline. Other College based options include an extension of the current safety training to address environmental issues.

External to the College, training specifically related to environmental standards is offered under accreditation schemes. These courses are designed to teach and develop the skills of Imperial members of staff to help the audit, assess and improve environmental services within the College and their impact outside of Imperial too. These courses include ISO 14001 training in Environmental Management and ISO 50001 Training in Energy Management Systems. These train employees in best practice related to sustainability and resource efficiency in their respective fields. This training could be supported by the College as a way of training sustainability community members and champions.

One of the findings from the teaching and learning strategy was that there are other ways that students can enhance their learning experience. Often a more holistic and reflective experience of the working environment can co-develop soft skills and experience for Imperial students to take into their next line of work, making them better equipped to contribute to the environment society and the economy once they leave their studies with us.

Here, professional staff, students and alumni involvement in teaching can share a new and different perspectives on the content of their courses, in terms of sustainability within the College (i.e. a problem for the Imperial Community), Students sharing their own and often new methods of learning and also the alumni experience in terms of life beyond the College and how to apply their understanding in developing their network for SACC.

Other non-standard ways of teaching and learning include the use of group projects, competitions and wider engagement to expose the individual to new ways of thinking and constructive feedback.

Often curricula and teaching hours of academic staff are pretty much at capacity. He we have suggested a range of options for structures of ways to expand a department's current offering to include aspects of sustainability related to their course.

5.4 Possible Actions

Suggested short term actions (3 year working plan):

- Develop a basic sustainability lecture plan to provide for all students in each department and offer to all students. [template created by sustainability coordinator; delivered by person associated with course; health and safety officer; sustainability coordinator or member of the energy and environment team];
- Incorporate sustainability into induction programmes for every new student and member of staff. [template created by sustainability coordinator; delivered by person associated with course; health and safety officer; sustainability coordinator or member of the energy and environment team];
- Work with Dr Roberto Trotta on the 2018 Horizons Programme review to discuss how to get climate change and sustainability taught more effectively to a wider group of undergraduates.

Suggested medium term actions (for delivery within the next College strategy 2020-2025):

- Review the current gaps in curricula (with support from programme and module leads) to suggest ways to incorporate more sustainability and action on climate change;
- Half of departments to have a ESD curricula plan to incorporate more sustainability into their models and degree programmes.

Suggested long term actions (beyond 2025):

- develop an integrated aspect to each degree programme with respect to SACC in their disciplines and discourse;
- Alumni in positions of impact related to SACC.

6 Research

The life blood of any world leading University is the research it undertakes, pushing the boundaries of understanding and practice, alongside its educational remit. Imperial hosts much world-leading research designed to improve the quality of life, whether it is power systems, water infrastructure or epidemiology; through the innovative ways of pushing understanding related to science, medicine, engineering and business. Much of the existing research undertaken at Imperial has leant itself to furthering sustainability across the globe and increasing the effectiveness of actions on climate change and sustainable development. Of approximately 460 research groups in the college eighty-four currently conduct research in sustainability and the climate change sphere and many others could align their work in the context of sustainability and the Sustainable Development Goals.

Fundamental science research includes understanding the processes underpinning the climate system in the atmosphere, the oceans, ice and on land. Researchers use novel observational techniques, state-of-the-art models, innovative statistical and computational techniques to investigate, for example, ocean-atmosphere interactions, the carbon stored in the biosphere, ice sheet flows or the drivers of air quality.

Research in engineering and technology includes low-carbon technologies, with leading work on solar photovoltaic, carbon capture and storage, electricity and energy storage and related processes. In power systems, new ideas for smart grid technology and systems design are being developed along with energy efficiency advancements for transport and buildings. Relating technology developments to policy is also a key theme. As well as extensive expertise in relation to low-carbon technologies, the College carries out research on other important environmental challenges including waste, the circular economy and industrial ecology, water management, land use and ecology. The Dyson School of Design Engineering also takes a very sustainability-focussed approach to its work, which includes innovative design of technology and processes to revaluate our impact on the environment.

6.1 Faculty and Departmental breakdown of research funding

Funding for research related to sustainability and the environment has averaged around £100 million from 2014 – 2016 (see Figure 6.1 below) or about one third of the College's total funding from research grants and contracts of £305 million a year.

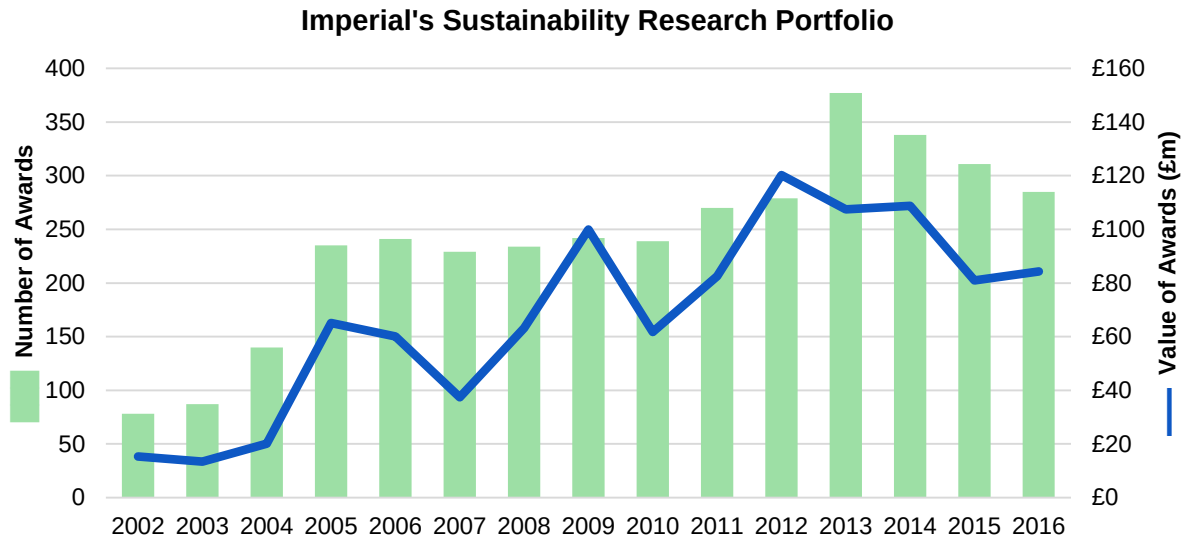

Figure 6.1: The number of grants and value awarded in each of the last 15 years on topics relating to sustainability. Grants from the Research Office awards database were classified using a set of 110 keywords related to sustainability.[44]

This is broken down into the different faculties over the duration of the time.

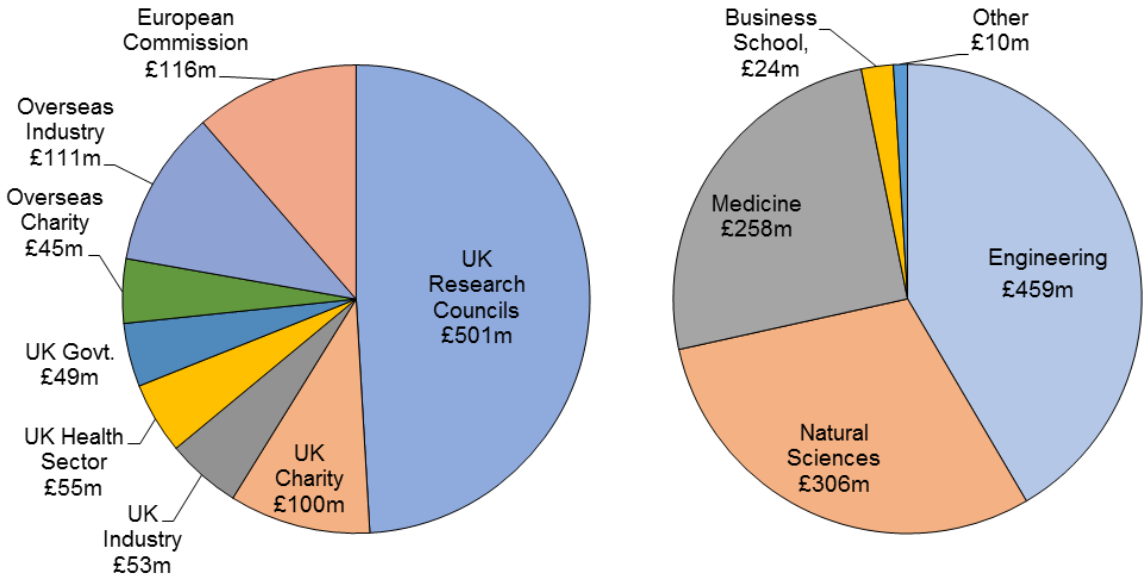

Figure 6.2: Breakdown of funding related to sustainability by source (left) and recipient (right). Values show the funding over 2002–16 in £m (total £1,020m).

[44] Keywords related to SACC were taken from two recognised lists: https://sustainability.unc.edu/files/2015/12/Sustainability-Keywords.pdf and http://guides.library.ucla.edu/c.php?g=180477&p=1191364. Results were edited and sense-checked for the scope of this study.

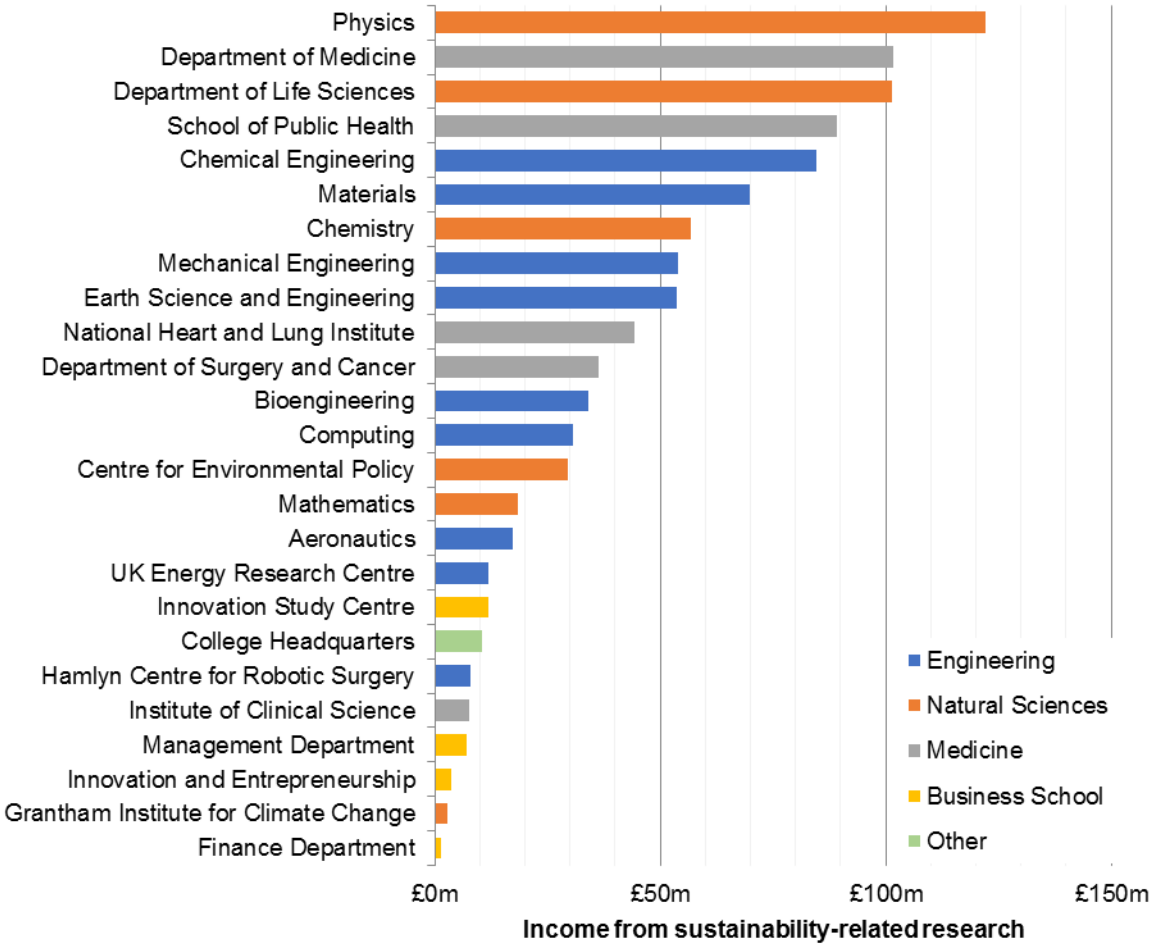

Figure 6.3: Breakdown of funding related to sustainability by receiving department. Values show the total funding over 2002–16 in millions of pounds. The ten smallest recipients are not shown.

As shown from the figures, many departments receive funding to work on a variety of sustainability related research; from Medicine and Public Health to Earth Science and Mechanical Engineering. There is greater scope for sustainable and impactful interdisciplinary research when approaching sustainability and action on climate change as a global challenge. Indeed, since the beginning of the GCRF initiative in 2016, the College has received 27 awards valued at over £22m in total, including £7m worth of funding in the last six months.

An analysis of research outputs, in the form of papers published, is presented in Appendix C. Approximately 250 papers per annum are published on environment-related topics by Imperial College authors.

6.1.1 Global Challenge Institutes

Supported centrally by the College via its Research Office the global challenge institutes have been set up to coordinate research related to global challenges that can only be overcome with

an interdisciplinary approach. Such a structure is particularly useful in the context of climate change, sustainability and environmental research. The Grantham Institute focuses on Climate Change and the Environment and the Energy Futures Lab on the future of energy technology and related systems. There is much cross over in the drivers and outcomes of these two institutes and over the last decade they have been coordinating research and engagement activities.

The projects that they have supported have enabled a whole new level of activity and policy engagement.

6.1.2 Centres and Networks for Excellence

The newly launched Centres and Networks for Excellence provide a halfway house for research in multidisciplinary themes, which are not large enough to constitute a global challenge institute but have reached a critical mass and have enough capacity to receive support to propel us in an international leadership position. Several of these include activities relevant to sustainability, notably the networks on Agri Futures, Air Quality, Malaria and Ocean Plastics.

6.1.3 External collaborations

Researchers at Imperial are engaged with a large number of external collaborators in the UK and across the globe in academic, policy, business and industrial sectors as well as third sector organisations. Future research success will, in significant part, rely on such links being maintained or expanded especially as government funding for research is increasingly being directed through channels related to overseas development.

Closer to home, the key roles played by various members of staff in organisations such as the UK Energy Research Centre (UKERC) have enabled Imperial research to reach policymakers while participation in the Climate KIC (EC Knowledge and Innovation Community) and the Health KIC has financed development of innovation. Uncertainty remains, of course, on the future of research engagement with EC partners.

6.2 Vision

The suggested vision for the college, based on our findings is as follows:

Our vision is to provide research and thought leadership in the global challenge field of sustainability and climate change in order to develop deeper understanding, solutions and technology towards a zero-carbon world and enhanced natural environment.

This aligns fully with current College ambition and desire to generate the highest quality research that benefits all of society. To realise this vision will require strategic planning and investment.

Many other universities have policies and visions related to sustainability and the environment, although these are often focused on operations, as discussed in Section [previously in Cross-Cutting]. An exception is the MIT five-year Plan for Action on Climate Change which has 5 pillars of which two are research focussed: the first to improve understanding of climate change and advance mitigation and adaptation solutions, the second to accelerate progress towards low- and zero-carbon energy technologies. These align precisely with our overall research perspective.

6.3 What are the current opportunities?

The College community understands and appreciates the standing of Imperial research when it comes to sustainability and climate change. Based on the views expressed in the online survey and the College strategy, the College should aim to do more in terms of not just high-quality research output in the aforementioned fields, but also in its implementation where possible on campus.

The College should aspire to provide research and thought leadership in the global challenge field of sustainability and climate change in order to develop deeper understanding, solutions and technology towards a zero-carbon world and enhanced natural environment. This should be supported by all of its assets and helped by the wider community too. This vision aligns fully with current College ambition and desire to generate the highest quality research that benefits all of society. To realise this vision will require strategic planning and investment[45].

Sustainability in research and operations can be achieved. Learning from others, MIT's five-year Plan for Action on Climate Change which has 5 pillars of which two are research focussed: the first to improve understanding of climate change and advance mitigation and adaptation solutions, the second to accelerate progress towards low- and zero-carbon energy technologies. These also align precisely with our overall research perspective.

[45] https://www.imperial.ac.uk/strategy/

Government policy, as expressed in its recently published Clean Growth Strategy, and also prioritised in its Industrial strategy, has clear and consistent statements of intent on environment and sustainability. Imperial, with its research strengths and established links with industry, is ideally positioned to help the government achieve its aims. Furthermore, the opportunities for the expansion of cleantech innovation at White City can help the government, national and local, to realise ambitions on clean technology.

There is also increasing focus through UKRI on multi- and cross-disciplinary research. The college's institutes and networks are well-positioned to coordinate or support proposals for such work, e.g. for applications to the Global Challenge Research Fund. It also has some first-rate facilities and infrastructure, e.g. in data science and HPC, and truly excellent staff at all levels.

All these attributes could be exploited further to enhance the college's offering in green science and technology and, with a more joined up approach to research, improve its research discovery and deployment.

6.3.1 Collaborations

The College generates high quality research in its departments or faculties, but a more multidisciplinary approach is needed to tackle global challenges like sustainability and climate change. A set of themes has been identified as challenges to furthering the agenda in research at the College, these include: Leadership, Awareness and Communication, Engagement, Funding and Non-financial support from college.

The analysis of the consultation and research undertaken in how the College and its peers undertake research in this field has uncovered a few key themes from both a top-down (coordinated by leadership) and bottom-up (driven by community members) perspective. We need to have leadership in directing the research agenda as well as supporting it (current/expanded role of the Grantham Institute/EFL, CEP).

Leadership is critical to driving and coordinating the agenda across the college. This is an even more pertinent point due to the nature of the challenge being undertaken. Sustainability, the environment and climate change are all interdisciplinary issues that require stewardship of a number of groups and departments. Often governance structures and frameworks need to be in place to allow students, professional and academic staff to interact and collaborate on certain issues. As outlined in section 4 within the context of our actions through College operations, where mandates for action are in place the remit for supporting these initiatives (in this case

collaborative research into SACC) is concrete and a sense of ownership and responsibility is felt to deliver these outcomes[46].

Communication and **awareness** of the scope and scale of the research being undertaken in the College has also been a challenge for those who may be wanting to collaborate more. This is a major opportunity area as students within the College can become knowledge creators for the benefits of the college in more ways than purely academic. Efforts are underway at the Grantham Institute to begin to map skills and academics related to the environment and climate change[47]. This aims to bridge the ignorance gap between researchers across College via a central and accessible database.

Fostering **engagement** between different groups of researchers and with the College is critical to establishing trust in the workplace and allowing co-creation of knowledge to occur. Encouraging and facilitating collaboration between researchers requires opportunities to engage in a professional setting with chances to disseminate research and develop deeper understanding for skills to be developed on top of their interactions. Sustainability Champion Networks have worked to achieve this in the past (see Operations section for more).

The College is also in a position to offer **Funding and Non-financial support**. Funding opportunities are explored in the operations section in a greater depth, whilst the living labs sections below outlines how the College can provide some non-financial support to research projects.

6.3.2 Living Labs

Living labs are user-centred, open innovation ecosystems that require systematic user co-creation approach that integrates research and the innovation processes in real life communities and settings. This approach to research has been adopted around the world and it centres citizens and users of research at the centre of innovation. This enhances the opportunities to learn from trialling new technologies, ideas, concepts and services. It also acts as an educational, outreach and operational tool to meet multiple targets associate with research (deployment and data).

Central to living labs are[48]:

- active user involvement (i.e. empowering end users to thoroughly impact the innovation process)

[46] Norton et al., 2017 Bridging the gap between green behavioural intentions and employee green behaviour: The role of green psychological climate Journal of Organizational Behavior, J. Organiz. Behav.

[47] See Simon Levey s.levey@imperial.ac.uk

[48] http://www.openlivinglabs.eu/FAQ

- real-life setting (i.e. testing and experimenting with new artefacts "in the wild")
- multi-stakeholder participation (i.e. the involvement of technology providers, service providers, relevant institutional actors, professional or residential end users)
- a multi-method approach (i.e. the combination of methods and tools originating from a.o. ethnography, psychology, sociology, strategic management, engineering)
- co-creation (i.e. iterations of design cycles with different sets of stakeholders).

6.3.3 Response in our survey

There were 362 individual points made concerning research related to sustainability at Imperial. There was a strong consensus that the overall standard is very high, with cutting-edge work across all faculties, and that new research strands could be based on existing strengths, e.g. sustainable cities, carbon capture, low carbon waste, solar energy, smart grids, electricity storage, climate change and non-communicable diseases, climate finance.

Another common theme was that research by itself is not enough and that Imperial should lead by example, act on the research results and put in place mechanisms to develop their potential. Many respondents suggested that the White City development was a marvellous opportunity to demonstrate excellent applied research on water, waste, buildings, transport etc. and that driving innovation in clean technology was an obvious win-win for the college. Suggestions for research with applications specific to Imperial's estate included:

- Blue-Green Infrastructure at Imperial – enhancing the College's ecosystem.
- Green Walls and Roofs
- Biomimicry in new developments
- SUDS and grey water use
- Greening the White City/Queen's Tower/Main Entrance foyer on Exhibition road
- Urban agriculture on campus
- Behaviour change in use of ICT
- Other trials in catering and campus services
- Recycling/upcycling materials for use in furniture
- Pluralism in sustainability decision making
- Low GHGs in anaesthetics
- Managing medical waste in a low cost/low environmental impact way
- Computer science – mapping SACC skills across the college

Suggestions as to how the College might stimulate research in sustainability-related areas included:

- A competitive fund could be open to early career researchers and PhD students to encourage innovation in application of their research ideas much like the CDT Dragons Den competition[49].
- Introducing more critical aspects of sustainability into the content of the research is to make it a requirement of all or some dedicated College/Presidential scholarships[50].
- Incentivising students and PhD's (supported by their department) to stimulate change is to financially support individuals or parts of the College to implement solutions to the wider environmental wellbeing and health of the College[51].
- Introduce a Living-lab in the College, particularly on the White City Campus.

6.4 Recommendations

1. To realise the vision
    a. Develop a strategic plan for sustainability and climate change related research, incorporating current strong activity across the College in this area, our strengths in multi-disciplinary research and consideration of Imperial USPs and a competitor analysis.
    b. Develop a plan for translation of current sustainability research that is suitably advanced and addresses identified societal sustainability needs.
    c. Develop a plan for the funding and investment required to deliver these plans.
2. Explore the role the Grantham Institute might play in enabling and coordinating this more integrated Sustainability Research activity.
3. Position Imperial as the key player in the development of London's Cleantech Innovation Centre.
4. Exploit opportunities within the UK political and research funding landscape
    a. Enabling the UK government to implement its Clean Growth Strategy and Industrial Strategy
    b. The availability of the Global Challenge Research Fund and the increasing multi/cross-disciplinary research focus of UKRI

[49] https://climatelaunchpad.org/ & https://mpecdt.org/the-cross-cdt-dragons-den-showcase-2017-is-the-grand-finale/
[50] https://www.imperial.ac.uk/study/pg/fees-and-funding/scholarships/presidents-phd-scholarships/
[51] http://studentlife.mit.edu/ideas/about-ideas

5. Provide competitive College funding to stimulate new research strands in this area which exploit existing strengths, such as sustainable cities, climate change and non-communicable diseases.
6. Encourage early career researchers and PhD students to exploit their research in this area through Dragon's Den type funding or through targeted scholarships.
7. Create a specific Sustainability initiative to use the Invention Rooms at White City, particularly the Advanced Hackspace, to bring together staff, students, alumni, start-ups and commercial partners to work together to convert research ideas into practical solutions to sustainability and climate change problems.
8. Devise mechanisms and venues for demonstrating and publicising the viability of emerging sustainability-related solutions
    a. White City would be a suitable site for this and the Development Director has already expressed an interest in this.
    b. Identify partners or spin-out opportunities for translating Imperial's sustainability research into practical application.
    c. Use Communications and Innovations to ensure emerging sustainable technology has a high profile with the media and potential stakeholder
9. Work with Advancement to identify funding opportunities for donors in this area; work with them to prepare value propositions and identify funding partners.

7 Societal Impact

7.1 Context

Imperial's vision is to be a global leader and influencer, not just in pioneering research and education but in achieving wider societal impact through our innovations, policy recommendations as well as collaborations and relationships with governments, business and the general public.

Imperial College London's strategy states:

> *"We will substantially increase our involvement in advising governments and industries on key policy areas such as science and innovation, education, health, energy and the environment, using alumni relationships, professional contacts and opportunities to bring key decision makers to the College"*
>
> *"We will work with stakeholder groups including technology user groups, social networks and patient communities to help make our work relevant to the needs of society"*

These stakeholders have shown a growing interest in working with the academic community to apply research to real-world sustainability challenges, and broader projects.

The College's societal engagement brochure outlines the College's aspirations to provide better support to the communities close to the Imperial Community. This outreach activity can help us share knowledge, concerns and solutions about sustainability and climate change action with public audiences.

Some of these societal impact activities can also help expand the College's networks, increase the profile of College work, and sometimes bring in income e.g. via consultancy or joint research projects.

7.2 What routes do we currently use to support wider societal impact?

The College supports the wider community in various ways. Figure 7.1 shows the objectives of engaging with different stakeholder groups around sustainability. This Figure shows that some of these mechanisms are already used in relation to sustainability and climate change issues, coloured green, others still could be expanded (yellow) and some have yet to begin but are approaches with potential.

The Grantham Institute, the Energy Futures Lab and the Centre for Environmental Policy, as well as other parts of the College, already contribute substantial efforts to support evidence-based policy making in relation to sustainability and climate change issues.

Innovation activities, currently funded through the Climate Knowledge Innovation Community (Climate-KIC) support the development and commercialisation of ideas that can help tackle climate change and improve sustainability through business.

Public engagement activities at Imperial often include a sustainability or climate change dimension. The Imperial Festival has regularly included an energy and environment tent, to be 'Greener futures' in 2018, and the regular Fringe festivals often include a sustainability dimension including at recent events on water (sustainable water management from engineering); atmosphere (GHG measurements and reductions from physics); and ice (climate change impacts on sea level).

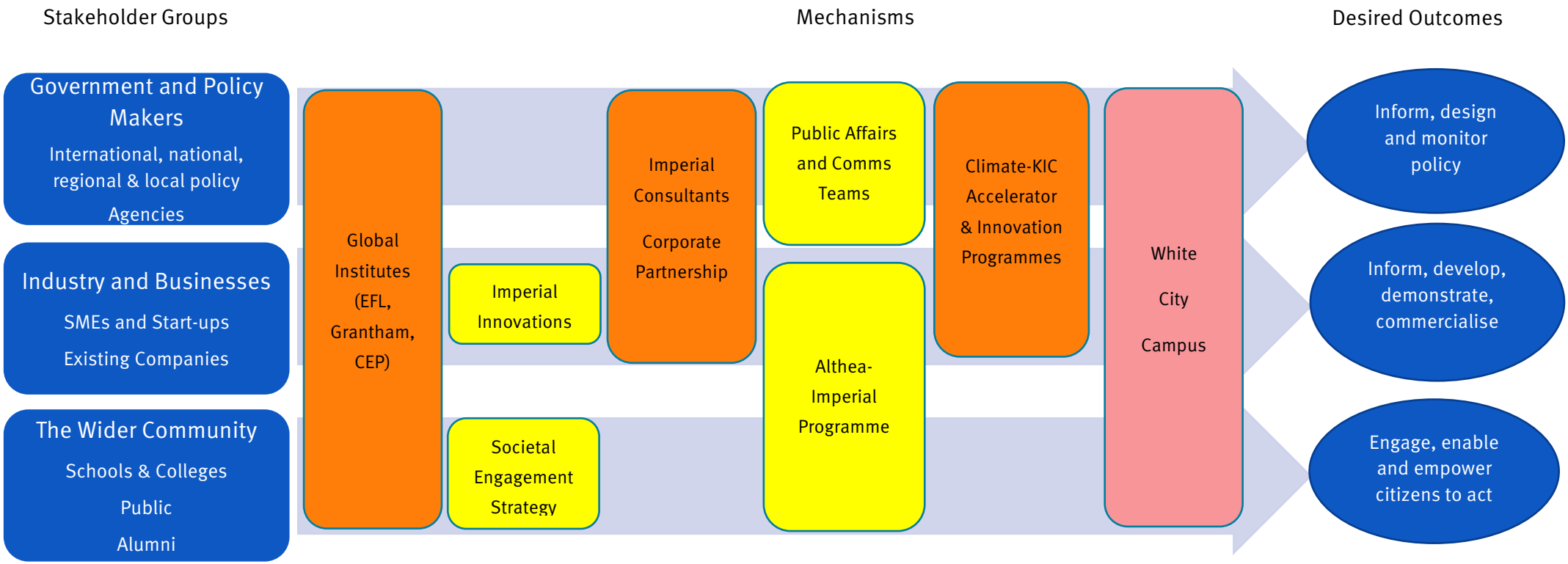

Figure 7.1: Stakeholder groups, audiences, mechanisms and desired outcomes for the College's[52] approaches to wider support in the sustainability and action on climate change field.

[52] This focuses on College-wide coordinated efforts, excluding many individual or research group orientated activities.

Box 1 explains some of the initiatives shown in the diagram.

Box 1: Existing mechanisms help Imperial influence sustainability and climate change action outside the College

Innovation and Commercialisation

Imperial Innovations: Commercialising business ideas in general, could be applied to sustainability e.g. Chrysalix Technologies

We-Innovate, Enterprise Labs, FONS MAD: Programmes support wider Imperial innovation programmes and could have an impact on sustainablity activity, but these are not within their remit specifically.

Imperial College Advanced Hackspace: Supports prototyping activity for start-ups, will be applied to the sustainability domain through collaboration with the Centre for Cleantech Innovation (CCI)

iHub: Provides labs for Climate-KIC startups with molecular technologies, partly funded by Climate-KIC, run by CCI

The Greenhouse: Supporting very early stage student ideation activity in climate change innovation business creation, funded by the Climate-KIC and run by CCI

Climate-KIC Accelerator Programme: Providing pre-seed funding and business and technical support, as well as facilities to support Cleantech start-ups move from ideation to seed investment, run by CCI

Better Futures Programme: Providing technical vouchers and student interns to seed invested cleantech start-ups, funded by ERDF run by CCI and ICON

Sharing Knowledge:

Societal Engagement Strategy: Sets an overarching strategic goal for Imperial to disseminate expertise and understanding, without seeking payment for these activities.

Central Communications and Public Affairs teams: Represents Imperial's perspective directly to key government groups and wider public audiences both on policy for science and, in some cases science for policy. Some of these messages could relate to sustainability issues.

Imperial Consultants: Providing expertise and understanding to clients outside the academic community. Many projects relate to sustainability e.g. working with the Greater London Authority and Sustainable Ventures in the Better Futures project to devise an approach to support low carbon start-ups; CEP projects with Veolia; wider projects with e.g. United Nations Environment Programme (UNEP) etc.

Global Institutes: The global institutes convene groups of non-academic audiences, build partnerships and networks and share the latest research and knowledge to help inform policy. The Grantham Institute and the Energy Futures Lab both engage regularly with these audiences on sustainability and climate change issues.

7.3 Our societal impact so far

7.3.1 International Policy

Imperial's talented and dedicated staff contribute significantly to national and international policy-making related to climate change and sustainability.

The Centre for Environmental Policy (CEP) hosts the Working Group III (WGIII) of the Intergovernmental Panel on Climate Change (IPCC.) Professor Jim Skea is co-chair of the WGIII, supported by a Technical Support Unit based at CEP, which includes Dr Raphael Slade, Head of Science and Dr Marion Ferrat, Head of Communications. Working Group III covers the mitigation of climate change, i.e. methods for reducing emissions of greenhouse gases and enhancing atmospheric sinks. The IPCC is arguably the largest global collaborative project on any scientific challenge. Working Group III is responsible for one of the three main IPCC reports due in 2021, is managing the IPCC Special Report on Climate Change and Land due in 2019 and is contributing to the scientific leadership of the IPCC Special Report on Global Warming of 1.5°C due in 2018.

Through the IPCC process, these Imperial staff members engage with governments and politicians around the world collating and sharing the latest evidence on climate change solutions and building consensus on how to take action.

The United Nations Framework Convention on Climate Change (UNFCCC) is a framework for intergovernmental efforts to tackle the challenges related to climate change. Having near universal membership, annual Conference of the Parties (COP) are held to review and take decisions to promote the effective implementation of the Convention. The ultimate objective of all agreements under the UNFCCC is to stabilize greenhouse gas concentrations in the atmosphere at a level that will prevent dangerous human interference with the climate system, in a time frame which allows ecosystems to adapt naturally and enables sustainable development. Imperial actively participates at the COP meetings, with approximately 16 members of staff and students attending every year, with several key speakers and at least one official side event. This exposure to the international climate change community cements Imperial's reputation as an organisation committed to and contributing to vital climate change research and action.

Ahead of the historic 2015 Paris Climate Conference (COP21,) Climate-KIC and DECC co-funded a project to create the Global Calculator, led by Dr Jem Woods (CEP). This revolutionary software is now China's principle tool for calculating, province by province, how the country will meet its climate change obligations. Dr Woods also attended the equivalent United Nations Environment Assembly (UNEA) conference on the Sustainable Development Goals (SDGs) in

2016. Additionally, consultancy projects for the World Bank, or United Nations agencies contribute to the international agenda.

7.3.2 National policy and the work of National Agencies

College academics have been at the forefront of steering government policy in several areas related to sustainability and action on climate change. Some of this work takes place via individual, and direct relationships, and in other cases through EFL, the Grantham Institute and the UK Energy Research Centre (UKERC), a national centre hosted at Imperial. The mechanisms of engagement are varied including consultancy, meetings, small workshops, briefing papers and responses to official government consultations.

Energy policy is one key area where Imperial has steered the national debate, with experts such as Dr Rob Gross (CEP), Professor Jim Watson (UKERC), and Professor Goran Strbac (Electrical and Electronic Engineering) often providing input that informs national policy decisions.

Imperial has input and influence on a range of other policy areas, with a particular strength on air quality, spearheaded by Professor Helen ApSimon (CEP). The Grantham Institute, under the academic guidance of Dr Erik van Sebille and the input of a range of others, provided extensive information to DEFRA, as well as other stakeholders, on ocean plastic pollution, preceding recent decisions by government to clamp down on plastic pollution.

Imperial has welcomed relevant civil servants from the Treasury, Department of Business, Energy and Industrial Strategy, the Environment Agency, the National Infrastructure Commission and many more to campus to discuss issues relevant to climate change and sustainability. These are only some examples of the rich mix of Imperial's environmental policy engagement activity.

7.3.3 Local & London Policy

At a local level, Imperial can engage with policy as a member of the local community. There is a strong link between the campuses' environmental footprint (see Operations) and the college's ability to influence sustainability decisions at a local level. Our home local authorities (Kensington and Chelsea; Hammersmith and Fulham) look to the College to be an exemplar in helping to design and implement policy related to the environment.

Acting as a local exemplar can be beneficial to the College's reputation. Although there have been some meetings with Hammersmith & Fulham in relation to sustainability and the White City campus, for example, there is significantly more work that could be done there (see below).

Imperial also has strong links at the regional level with the Mayor's office and the Greater London Authority (GLA), including the membership of advisory boards. In the past has Imperial

has worked together with the Greater London Authority (GLA) to develop low emission zones and relevant guidance in the wider London Plan, further strengthening our expertise in related air quality policies. We are also currently exploring opportunities to enhance the circular economy work of the GLA, led by the London Waste and Recycling Board (LWARB). Using the Grantham institute as a conduit, academics from engineering, the Dyson School and CEP have contributed to the Circular Economy strategy for London, and related ideas for pilot projects, that could be housed by the university.

Many individuals provide input to London-wide policy making. For example, Professor David Gann's work on the Smart London Board, Professor John Polak's with Transport for London and Professor Richard Templer's on the London Sustainable Development Commission. The latter has led to the Mayor's support in his London Plan for a Cleantech Innovation Cluster (see below).

7.3.4 Industry and businesses

The College currently works with many public and private partners to help enhance sustainability, often through consultancy such as Veolia and Sainsbury's. These opportunities to engage with industry can attract internal funding to support further research in this field.

The Grantham Institute, EFL and the Business school's Centre for Climate Finance and Investment often hold events or small workshops targeting business, industry or the financial sector specifically to build community and share sustainability-relevant research, commentary and debate.

7.3.5 Start-ups and Small and Medium-sized Enterprises

The College and its community also supports small and medium enterprises (SMEs), start-ups and individuals to develop and take technology and ideas to market. Here we focus on cleantech, which we define as the products and services that enable us to avoid or clean-up environmental damage resulting from human activity.

The Climate-KIC accelerator has helped focus some of this support on to businesses tackling climate change and sustainability challenges. In the past six years it has successfully graduated 41 start-ups who have so far won over $140M of investments and created over 500 jobs. The companies cover a wide range of topics: alginate replacements for plastic bottles (Ooho!); catalysts to convert CO_2 into plastic; a novel system to convert 90% of solar radiation into electricity and heat; a means of removing CO2 from the air through energy and lime production; an electronic nose to detect soil condition; and an indicator to tell the consumer when food is no longer edible.

The Better Futures project – a collaboration between the GLA, Sustainable Ventures, ICON and CCI – is in the second year of a three-year programme of support for Cleantech start-ups who have seed investment and are seeking to grow their new business. ICON supply technology vouchers for R&D to be undertaken under consultancy by Imperial staff on behalf of the start-ups. CCI identify internships for Imperial students to undertake paid work with these start-ups.

7.4 How can Imperial do more?

It is suggested that we aim to build on the existing engagement activities described above and for the strategic focus of the College to have more real-world societal impact in sustainability and climate change action. Some ideas are provided below.

7.4.1 Boost our innovation potential

On innovation, we can build on the success of the Climate-KIC accelerator, the innovation and education activities it supported and the opportunities that the new White City Campus presents.

With this in mind, the CCI presented College with a proposal for the creation of a physical co-location centre on the new campus to act as a focus for an integrated programme of Cleantech innovation activities. The intention here is for Imperial to become the focus for the accelerated growth of a London Cleantech Innovation Cluster. This idea is now explicitly supported by the Mayor both as a policy in the London Plan and in the Economic Development and Environment Strategies.

The opportunity to leverage Mayoral influence in the development of Cleantech Innovation at Imperial is potentially a key element in developing the White City Campus. The temporary innovation spaces being developed by ThinkSpace could be home to a major Cleantech Incubator and a Proving Factory as outlined in Better Future, the route map to the creation of Cleantech Innovation Cluster. ICAH and space in the Invention Rooms provide a bridge facility for the Accelerator programme and the creation of an MSc in Cleantech Innovation & Entrepreneurship prior to the development of the larger CCI co-location centre. The i-Hub already houses the molecular technologies being developed by Climate-KIC start-ups and the Oil and Gas Climate Initiative. Clustering of Cleantech at the campus would add to this.

The White City would be a focal point for London's Cleantech Innovation Cluster, playing an analogous role to Stanford's Science on the development of Silicon Valley, for Cleantech and West London. In principle it could also offer our innovator colleagues the opportunity to test, demonstrate and implement their cleantech on the campus itself (see more below).

These activities will also help us continue to influence GLA policy in this area. They are also consistent with LBH&F's request that we develop our new campus with clear evidence that we will be creating environmental benefits to the Borough.

7.4.2 Increase the effectiveness of our Policy engagement

Existing activities to influence policy are strong but dispersed. The next challenge for policy impact could include:

- Greater coordination between different activities, to increase the impact and efficiency of activities. This could include new centres, such as the centre for air quality and health, or just increased supported coordination between EFL, CEP, Grantham, school of public health, central college PA etc.
- Development of metrics for measuring impact to help focus activities effectively
- Ethical Investment to allow College Endowments to be invested in businesses that are environmentally sustainable
- Consider how the College could promote sustainable and low carbon technologies on campus through operations
- Increase cooperation and collaborations with companies and organisations aligned with sustainability and action on climate change
- Increasing the scope of topics covered and staff members involved in impact activities (see building capacity below), perhaps through the development of policy imp[act networks
- Using the Imperial Alumni network to increase policy impact through relationships
- Consider how we could welcome the involvement of policy stakeholders with college in different ways e.g. lecturing, short fellowships (like the Grantham Knowledge Exchange Fellowship) etc. to build relationships.

7.4.3 Use large development projects as a springboard for influence

The new White City campus, and South Kensington Masterplanning, generates the opportunity for Imperial to integrate its sustainability expertise in one place, showcasing a centre of excellence for the world to see and engage with.

We must ensure that our campuses are best in class with respect to sustainability, and then use them as a platform to engage on the topic of sustainability and action on climate change with policymakers and businesses alike. The White City campus is a great example where Operations can be enhanced with Support and Research, in particular the Living Labs example (see Operations section).

7.4.4 Showcase our Research and Innovations on our Campuses

There are a range of new technologies and processes that emerge from Imperial researchers that could contribute to a reduction in our own emissions and enter the innovation pipeline. We should actively procure and pilot these approaches on our campus. Examples include:

Imperial College Advanced Hackspace (ICAH)

The ICAH is a community that likes to make, try, design and hack ideas and put them to practice. It is primarily a workshop space that is open to all members of the College to support their efforts to produce early-stage protoytpes in electronics, mechanics, software and biological products. They have facilities in White City (includes the biohackspace) and south Kensington. The biohackspace also includes facilities to bring engineers and designers into the realm of biology; which includes 3D printers. The outputs of this particular biohackspace have helped develop innovative ideas around physical models of body parts for patients; facilities for nucleic acid and protein synthesis for synthetic biology and diagnostic medical device applications; rapid prototyping of microfluidic devices, and tools for prototyping low-cost laboratory equipment for developing areas[53]. These facilities which have grown organically with the support of College have helped unlock greater potential from the College community in innovation.

Paper Cups

The College's campus services were involved in a trial to encourage increased use of reusable cups and less paper cups. The research showed that a mixture of alternative reusable cups and a financial incentive could reduce disposable cup use and its associated waste. The trial formed part of a wider study that made the news[54] as well as benefits for the College in terms of resource use[55].

7.4.5 Enabling our own community to have societal impact

Some of the Imperial staff and teams are already very active in relation to societal impact. We should continue to build the skills and awareness of staff and students so that they can get engaged. We may also want to create more specific opportunities for engagement. Some ideas include:

Staff – Media training, awareness of what's going on at imperial and a central hub for coordination, communications and public affairs need to be aware;

[53] https://wiki.imperial.ac.uk/pages/viewpage.action?pageId=85895755

[54] https://www.theguardian.com/environment/2017/mar/30/reusable-incentives-could-slash-disposable-coffee-cup-waste

[55] Please speak to Jemma Morris for further information j.morris@imperial.ac.uk

Students – framework to help, be it Green Impact or a bespoke College idea; competitions to design sustainable uses of space or materials that can be worked into the new White City Campus.

7.4.6 Active engagement with External stakeholders

Through the high-profile external facing global institutes we should speak out loudly and clearly about our desire to be leaders in climate change action and sustainability. We should use our voice to encourage our external stakeholders to get involved in this challenge and work with us in particularly.

We can encourage business and policy stakeholders to work with us, because they might see some of the following advantages:

- The opportunity to invest in sustainability projects at Imperial College London
- A higher profile in sustainability and climate change
- Strengthened connections to both industry and policy makers.
- Greater influence in steering thought and action in this field
- Setting the standard in how education and research is conducted in this and related fields
- Attracting greater funds related to the work that the College undertakes

8 Action Plan – Recommendations

8.1 Context

This scoping study was carried out with the endorsement of the Provost Board following the presentation of a paper ('Making Imperial College London a Leader in Sustainability and in Action on Climate Change') on 24th February 2017, to establish Imperial's current position and activities in this area and explore how Imperial could achieve this goal through four levers: Act, Inform and Innovate, Educate, and Support and Influence. The initiative was motivated by a realisation that many of Imperial's major competitors were adopting a high profile in this space (MIT's 2015 '5 year Plan of Action on Climate Change', University of California target to become carbon neutral by 2025) whereas the College's stance was not clear or very visible. Moreover, Imperial's performance in sustainability ranking tables, such as the People and Planet Green League of Universities, was extremely poor, suggesting either mediocre performance or inadequate communication on sustainability and climate change issues.

The review was carried out in the context of major growth in momentum for sustainability action in recent years: the global agreement on Sustainable Development Goals in 2015, the UK government's Clean Growth Strategy in 2016 and locally the London Environmental Strategy in which Imperial has the opportunity to play a leading role. The study sought to identify opportunities for action and integration across six areas of the College's activity: Operations, Education, Research, Influencing (Policy), Outreach, and Alumni Engagement/Advancement.

This set out to:

- Establish what we are doing now in these six areas on Sustainability and Climate Change Action
- Research best practice and benchmark Imperial against other universities
- Identify challenges and opportunities for future action and integration
- Test the appetite of staff and students for active engagement with future initiatives – and driving them
- Make recommendations for a 3 year plan about practical ways the College can enhance its sustainability and climate change mitigation offering.

A number of consultation methods were used to gather information:

1. Survey, with about 850 responses, including Alumni and Friends of Imperial
2. Interviews and Focus groups with: Campus Services, Estates Facilities and Projects, Student Union, ICT, Secretariat, Education and Research Offices.

3. Studies of courses and research
4. 3 MSc projects
5. Contact with other institutions

This revealed that there are examples of good practice in most areas all areas, especially in:

1. education and research (about 1/3 of our funding relates in some way to sustainability, energy efficiency and climate change mitigation)
2. some spin-outs such as Plaxia (polymers from sustainable feedstocks) and Nexeon (more sustainable rechargeable batteries)
3. combined heat and power (CHP) – 2 x 4.4 MW plants at South Kensington and new installations at Wilson House and White City accommodation
4. Estates Facilities initiatives such as
    a. The adoption of an Environmental Management System (EcoCampus) and the drive towards achieving ISO14001 Environmental Management Standard
    b. Efficiency monitoring and improvement, with a £600K pa budget

However, the activity is largely uncoordinated, has quite a limited impact on our own operations and research translation, is under-resourced and poorly documented both on the College website and by internal stakeholders. The College performance in all six areas is fully documented in the previous chapters.

A major concern is the extent to which we are lagging behind our peers in sustainability practice. For example:

- UCL where the sustainability team has an annual budget of £30-50 million with responsibility for paying energy bills and a mandate to reduce them
- MIT has had an office for sustainability for 10 years and developed 'living labs'
- Cambridge where all staff/students can propose business plans for building efficiency funding consideration (£2 million fund)
- King's College London has over 75 sustainability champions across the College supported by the Facilities Team.

However, from the survey it is clear that staff and students have a huge appetite for more action on sustainability and avoiding climate change:

- 97% think we should be acting on sustainability and climate change and doing more
- 98% think we should spend more money on sustainable infrastructure (existing buildings and White City)
- Respondent priorities are: 1) Built Environment and Building Efficiency; 2) Energy Generation and Consumption; 3) Waste and Recycling.

- 308 respondents (35%) said they would like to be involved in future initiatives
- 83% are dissatisfied with our national performance in terms of sustainability (141st out of 151 universities in The Green League of Universities survey)
- 82% felt Sustainability should be led by the President, Provost or a Sustainability Director

8.2 Recommendations

With this in mind, we make the following key recommendations:

1. Vision: Imperial aspires to be a world leader in Sustainability and Action on Climate Change, by example through the way we operate our campuses and operations, through our research and translating sustainable solutions into practice, through our education of students by embedding sustainability issues into the curriculum and the student experience and through our policy work and outreach to encourage, drive and enable sustainable practices with our corporate partners and society at large.

2. To achieve this, sustainability and action to avoid major climate change should be a key, explicit part of the College strategy.

3. The College leadership should demonstrate strong, enduring and visible commitment to sustainability issues, providing environmental leadership and vision and making suitable public statements and commitments about this area similar to those made about inclusivity and diversity, for example.

4. Imperial should lead the local, national and global community on sustainability and action on climate change, by example creating the most sustainable university campuses globally and becoming the go-to institution for greater understanding and practical solutions in this field.

5. Imperial should take a more holistic approach to advancing sustainability across the College, encompassing all three of its principles – environmental, social and economic – instead of focusing mainly on the latter, which has tended to be the emphasis hitherto.

6. The step-change required can only be achieved by strong engagement and empowerment of staff and students to be more environmentally minded and aware. Imperial should aim to create environmentally conscious future leaders, equipped to apply sustainability principles to real-world problems both during their studies and in their future careers.

7. As part of this, the College should commit to a headline target to achieve zero net emissions across all its campuses by 2050, in line with Mayor of London targets, with ambitious interim carbon emissions reduction targets.

8. The College should provide the resources and encouragement to grow a sustainability culture and community across Imperial. Sustainable actions and projects should be seen as an investment (with a medium to long term return) rather than as an upfront cost; if a university such as our's cannot take a long-term systems view, how can we expect governments and society at large to take these challenges seriously? The benefit will come from a step-change in Imperial's public and professional reputation as well as financial returns from significant reductions over time in energy and other utilities costs.

9. A support structure should be set up for sustainability activity and key individuals and groups identified to enable delivery of the strategy. The approach requires top-down support and coordination together with bottom-up action and initiatives.

10. To this end, the College should appoint an Assistant Provost for Sustainability (APS), along similar lines to the post created to drive Equality, Diversity and Inclusion. The primary initial responsibilities of the Assistant Provost will be:
    a. To develop a sustainability strategy for adoption by the College
    b. To create and nurture a 'Greening Imperial' culture and community that is embraced by all College staff
    c. To devise and implement an action plan to deliver the strategy against agreed targets
    d. To monitor progress in achieving these targets and to hold the College community to account; metrics should be widely publicised to encourage participation across the College
    e. To improve reporting and communication of sustainability goals and achievements; in particular publish to upgrade the sustainability/environment website and publish an annual sustainability report.

11. To help increase the visibility of the activity across the College, the APS should lead a high profile activity called Greening Imperial (or similar). This would bring a sense of campaign and urgency to the activity and enable committed participants to engage and feel part of the whole activity.

12. The Assistant Provost should be supported by a Sustainability (Greening Imperial) Steering Group with representation from College top management for the following key areas: Operations, Education, Research, Policy and Influence, Outreach. This group takes

ownership of sustainability initiatives and decided on priorities and targets. *(To emphasise this, the group could be called the Sustainability Leadership Group.)*

13. Driving sustainability action
    a. Each Department, academic and non-academic, and Institute appoints a 'Sustainability and Climate Change Mitigation Champion', supported by a Sustainability Action Committee, to identify and action initiatives at Departmental level and coordinate participation in cross-College sustainability activities.
    b. The Undergraduate, Postgraduate and Postdoctoral Researcher communities should each be led by a 'Sustainability and Climate Change Mitigation Champion', supported by a Sustainability Action Committee, building on existing initiatives by the Student Environment Society.
    c. The existing Greening Imperial *ad hoc* group is re-constituted as the Greening Imperial Advisory Group to support the Assistant Provost, the Sustainability Champions, and 'bottoms-up' projects from departments, institutes and students; to advise the Sustainability Steering Group as required.

14. Suggestions for the content of this action plan and suitable targets are included in the sections below. A combination of different types of projects is required, from short-term 'low-lying fruit' such as implementing accepted good practice to give fairly immediate returns, to more ambitious buildings-related projects such as refurbishment and retrofit and South Kensington, Hammersmith or White City new build, and demonstrators of emerging technology such as ground-source heat pumps, where we could work with our neighbours by reactivating an earlier 1851 Group project.

15. Positioning Imperial as a key player in the development of London's Cleantech Innovation Cluster would be one route to establishing Imperial as a recognised leader in sustainability amongst government and the broader community.

8.3 Action Plan

8.3.1 Year 1

1. Provost Board approves plan for enabling a step-change in the College's sustainability activity and profile, the appointment of an Assistant Provost Sustainability and the general approach to drive and support the activity.

2. Provost's Office develops a job description for Assistant Provost Sustainability (APS) and assigns resources in 2018-19 budget, including administrative support.

3. APS post advertised and appointment made.

4. APS gives priority to:
    a. Proposing an Imperial Sustainability Strategy, for approval by the Provost Board and subsequent incorporation into the College strategy.
    b. Working with Department/Institutes/Students (Union) to set up Sustainability Action Committees and identify Sustainability Champions (SCs); establish a motivated and effective Sustainability Champions Network to support each other, exchange best practice and enable cooperative activities across Faculties and the College
    c. Engage with individuals/groups identified in the survey of this scoping study to involve them in the SCN (and projects as in 5 below); identifying opportunities for enthusiastic people to participate actively is a key part of mobilising the enthusiasm for sustainability action that is evident across the College.
    d. Building on the recommendations of this report to develop a (rolling) 3-year action plan to implement the strategy across the five key areas of recommendation 8, and a series of annual metrics against which to monitor progress. This will be done in collaboration with the Sustainability Steering Group (SSG) and SCs. Metrics should be set at College, Faculty and Operating Unit level.
    e. Resources required at APS/SSG level for implementation of 2018-19 plan to be identified in time for these to be incorporated in budget.

5. First steps in the working plan are to build the foundations for sustained change in each of the five key areas. More specific suggestions for action in each area are given below. The priorities for year 1 should be:
    a. To work through the SSG owner for each key area, the SCs and the information gathered in this report, to identify
        i. Existing sustainability activities and people that can form the foundation for growing the sustainability base and engagement; encourage firming up on targets and metrics if not in place;
        ii. New projects for which enthusiastic leaders can be identified, prioritising if necessary according to delivery against strategy;
        iii. With the SCs and Operating Units how any additional required resources will be provided.
    b. Encourage and support project leaders/teams to develop clear action plans and targets/metrics; use the Greening Imperial Support Group as a resource for this.

6. Establish a database of existing sustainability-related activity in the five key areas; exploit this in a number of ways:
    a. Recreate the Imperial Sustainability website so that it fully reflects College strategy, policies, the new Sustainability governance structure, existing activity in operations, education, research, policy and influence and outreach, new and planned initiatives, targets/metrics and performance against these. In particular the site should address all the categories against which surveys like the People and Planet Green League of Universities evaluate universities. An urgent immediate target is to have all the current data and information available for the 2018 audit by Green League in July.
    b. Develop with the Global Challenge Institutes, in particular the Grantham Institute and Energy Futures Lab, and the communications and digital team to design a tool to help students, academic and professional staff to identify sustainability, environmental and climate change orientated skills and research in the College that could be applied elsewhere to the benefit of society.

7. The aim with new initiatives in year 1 should be
    a. to identify the 'low-lying fruit' where significant impact on our sustainability profile can be achieved with relatively little or readily available resource;
    b. to use these to demonstrate by summer 2019 the significant change these have made on our sustainability performance
    c. to communicate effectively within and outside the College the most effective and impressive achievements to start to establish Imperial as a sustainability leader
    d. to prioritise and develop plans for projects for years 2 and 3 and line up the necessary resources.

8. Establish good lines of communication with Neil Alford (Associate Provost, Academic Planning) and Graham Stark (Development Director for White City Campus) to identify opportunities for
    a. Building sustainable concepts into the construction and operation of the White City campus;
    b. Measuring and publicising the benefits of these approaches;
    c. Testing and demonstrating new sustainability technologies and solutions developed at Imperial on the White City campus
    d. Engaging with local stakeholders, such as Hammersmith and Fulham Council, to maximise sustainability benefits as White City develops and linking up with the outreach work of Associate Provost (Academic Partnerships).

9. Consider rejoining the International Alliance of Research Universities (IARU) network, and/or the NUS Green Impact and the International Sustainable Campus Network, for ongoing collaboration and knowledge exchange of best practice.

10. Update rolling three-year plan for 2019-22, with budget requirements identified in time for the 2019-20 planning round. Approval by Provost Board.

11. Produce end-of-year Sustainability Report, summarising 2018-19 activity and impact. Review by Provost Board.

8.3.2 Year 2

1. Implement year 2 project plan in each of the five key areas and provide necessary support through APS, SSC and Greening SSG

2. It is likely that in Education, activity in year 1 will have been to plan courses or put in place resources in order to ramp up activities in year 2, 2019-20 academic year. So a key task will be to work with Departments to provide necessary support and to monitor progress, help exchange learning experiences and to develop an overview of how sustainability is becoming embedded in the curriculum and project opportunities across the College.

3. Establish an Imperial Sustainability Forum to showcase Imperial activity, increase awareness across the College, encourage debate on key issues, enable spreading of best practice across College and from outside, host talks from sustainability thought leaders to seed future activity.

4. Identify opportunities for collaborative projects with companies (eg existing partners), NGOs and other communities.

5. Continue to update website and identify other mechanisms to promote Imperial as a global sustainability and action on climate change leader.

6. Consider in more detail how our activity and priorities relate to the way Imperial is evaluated by Green League and engage more closely with other global sustainable university ranking schemes such as STARS and the UI Green Metric University Ranking.

7. Work with Estates, SCs and Departments/Institutes to identify ways to showcase or demonstrate new Imperial sustainability initiatives and concepts at South Kensington and other campuses.

8. Consolidate plans and build up activity for the White City campus.

9. Support the development of the Cleantech Innovation Cluster by linking in appropriate Imperial activity.

10. With SSG, update rolling three-year plan for 2020-23, with budget requirements identified in time for the 2020-21 planning round. Approval from Provost Board.

11. Produce end-of-year Sustainability Report, summarising 2019-20 activity and impact; evaluate progress against original targets and aspirations. Review by Provost Board.

8.3.3 Year 3

1. A key activity of year 3, academic year 2020-21, will be to carry out an assessment on Imperial's sustainability profile and performance:
    a. Improvement and major successes compared to 2018
    b. Benchmarking against UK and global academic sector
    c. SWAT analysis to identify future opportunities and priorities

2. Consider possibility of a major event to establish Imperial's credentials for sustainability achievement and thought leadership and use as launch-pad for future initiatives.

3. Increase activity in policy, influencing and outreach as Imperial's leadership position and credibility increases.

4. Evaluate the effectiveness of the governance structure and make work with SSC on recommendations for organisation and resources for cross-College sustainability activity in 2021 and beyond, which will maintain and enhance Imperial's sustainability profile and performance.

5. Produce end-of-year Sustainability Report, summarising 2020-21 activity and impact and progress over period 2018-2021.

6. Provosts Board to hold review of progress since 2018 and the operation and impact of the Greening Imperial activity since its inception.

7. Produce new three-year plan for 2021-24 in the light of this review, with budget requirements identified in time for the 2019-20 planning round. Approval by Provost Board.

8.4 Specific Recommendations for Key Sectors

8.4.1 Operations

Key Players: Estates & Facilities; Estates Developments and Projects; Campus Services

Specific recommendations:

1. Operational Targets
   Adopt a wider range of sustainability objectives and targets that align to government targets and metrics, whilst maintaining existing operational KPIs, to communicate internal sustainability to departments and community members. These targets should be in line with government guidelines: currently 30% reductions against a 2008/09 baseline by 2020/21; 50% reduction against a 2008/09 baseline to be met by 2030.

2. Energy and Carbon
   a. ***Ambition: We aspire to a long-term ambition to be carbon neutral from energy use by 2050***
   b. To commit to specific, timely and ambitious targets for energy and carbon emission reductions e.g. To reduce (equivalent) carbon emissions from energy use by at least 34% by 2020 against a 2005 baseline
   c. Re-consider and assess opportunities to install renewable energy technologies, to aid in transition to a zero-carbon future

3. Water
   a. ***Ambition: We aspire to be a responsible user of potable water and minimise its use in our operations and by individuals***
   b. Alternatives to potable water should be used wherever possible, such as rain water harvesting or on-site recycling of water for irrigation or toilet flushing.
   c. Community Programmes to promote behaviour change such as taking shorter showers should be encouraged.
   d. Improve reporting of current practices; no information currently visible
   e. Immediate target: To reduce water consumption by 20% by 2020 against a 2005 baseline.

4. Waste and Resources
    a. ***Ambition: To minimise and actively manage all waste through elimination, reduction, reuse and recycling.***
    b. Maintain and grow current good performance in this area.
    c. Consider signing up to the UNEP campaign to eliminate major sources of marine litter by eliminating single use plastic from the campus (catering outlets and shops.) Review overall sustainability benefits of One Water products and consider alternatives such as CanO Water which is recyclable and resealable.
    d. Immediate targets:
        i. To send zero non-hazardous waste to landfill by 2020.
        ii. To achieve continuous year-on-year reductions in waste arising per FTE staff and students.
        iii. To recycle at least 95% of total waste produced at the University by 2021.

5. Biodiversity, Urban Landscapes and Ecosystems
    a. ***Ambition: That, in the expert opinion of the Ecological Advisory Panel, no construction, refurbishment or maintenance work on the estate has a net negative impact on biodiversity and, where possible, the impact is net positive.***
    b. Plant more trees to create 'breeze corridors' reducing the energy demand for air conditioning (protecting against the urban heat island effect,) creating a more aesthetic environment (leading to increased wellness and productivity in staff and students,) sequestering carbon emissions and improving air quality.
    c. Map biodiversity on our campuses.
    d. Consult a landscape maintenance company to advise on how to maximise benefit from Imperial's limited space.
    e. Increase the number of green roofs, to protect against flooding.
    f. Harvest rain water, which can be used to irrigate the vegetation in dry seasons.
    g. Invest in a living green wall (e.g. on Dalby Court), which will increase biodiversity (insects and birds), improve air quality (by trapping particulate matter), offer a 'wow factor' enhancing Imperial's green credentials, improve health and well-being, afford flood mitigation and insulation.
    h. Make better use of the 'Secret Garden' behind Prince's Gardens by e.g. increasing the number of bee hives and opportunities for staff and students to be involved in their management; planting herb and vegetable gardens and using the produce in the catering facilities.
    i. Encourage staff and students to become stewards of campus open space.

6. Built Environment
    a. ***Ambition: To minimise the environmental sustainability impacts of Imperial's new construction and to use refurbishment projects to enhance those of existing buildings.***
    b. Establish and implement a standard for sustainable construction and refurbishment at Imperial that is context specific and is considered a leading approach in comparison with our peers.
    c. Liaise closely with Associate Provost, Academic Planning and Development Director for White City Campus to identify opportunities for building sustainable concepts into the construction and operation of the White City campus; see 9.3.1.8 for other recommendations relating to White City campus.
    d. Immediate target: By 2020, for 95% of buildings (by floor area) to have a minimum Display Energy Certificate rating of 'D'.
    e. Longer term target: external awards for sustainable design and construction.

7. Sustainable Food
    a. ***Ambition: To develop a clear sustainable food sourcing policy which is visible to customers***
    b. Provide information on the sustainability aspects of different food sources and encourage positive choice between consumption of vegetarian and vegan foods and ruminant meat, for example.
    c. Ensure animal welfare standards are adhered to and insist on Red Tractor certification.

8. Transport and Travel
    a. ***Ambition: To provide viable and accessible sustainable travel options for staff and students for travel to work, travel at work and travel for work which results in a reduction of carbon emissions.***
    b. Develop campaigns to promote cycling and walking.
    c. Phase in electric fleet vehicles.
    d. Implement offsetting international flights; rather than rely on individuals to do this, Imperial should monitor and record all international travel and offer a combined offsetting initiative, such as buying and protecting areas of rainforest in the Amazon or Indonesia.
    e. Promote video conferencing to reduce the amount of travel required.
    f. Immediate targets:
        i. Reduce the carbon emissions from flights per capita by 25% by 2021
        ii. At least 75% of staff to be commuting to work by sustainable modes of travel by 2025

9. Procurement and Purchasing
    a. ***Ambition: To influence positively the sustainability performance of suppliers and make sustainability credentials a key selection criterion of the goods and services that we purchase.***
    b. Increase the number and accessibility of drinking water stations on our campuses; make these locations more prominent on the website and notices around campus.
    c. Eliminate single-use plastic bottles from campus.
    d. Eliminate procurements that contribute to rainforest destruction e.g. palm oil and its derivatives.
    e. Increase communication, visibility and education about this sustainability commitment.
    f. Improve transparency of supply chains.
    g. Engage in community food projects.
    h. Targets:
        i. Adopt Defra Sustainable Procurement Flexible Framework (or similar), ensuring that procurement involves not only sourcing greener products but also involves planning ahead to manage demand, effective ongoing contract management and dealing with supply chain risks and impacts.
        ii. Demonstrate benefits of sustainable procurement by making Imperial procurement framework more attractive financially, more environmentally friendly and faster.
        iii. Achieve at least level 4 of SPFF by 2021.

8.4.2 Leadership and Governance

Key Players: President, Provost, Provost Board, Assistant Provost for Sustainability, Vice-Provost Education, Vice-Provost Research, Head of Building Operations, Co-Director of Grantham Institute (Policy and Influence), Associate Provost Academic Partnerships (Outreach), Student Union Environment Officer

Important Deadlines:
Forming Sustainability Steering (Leadership) Group (Q1 2018)
Appointment of Assistant Provost for Sustainability (Q2 2018)
Sustainability 3-year plan and budget (Q3 2018)

Specific Recommendations:
1. The key steps to achieving the goals for 'Greening Imperial' are
    a. Incorporating sustainability leadership into the highest levels of governance and management to drive the culture change from the top.

b. A suite of measures to inform and empower grass roots activity by staff, students, alumni and partners.

2. Sustainability leadership is about creating a shared vision, building capacity, empowering and inspiring others, facilitating change and leading by example. Through harnessing our innovation and creativity, Imperial can both demonstrate sustainability by example to the outside world and bring new solutions. By making this strong commitment to sustainability, Imperial would encompass the principles of inclusivity, integrity, stewardship and transparency, as well as upholding the highest standards of governance and ethics.

3. To mobilise and empower the community, the key players are:
   a. The Sustainability Champions Network (SCN), with members embedded in departments, institutes and the student body
   b. A Greening Imperial Support Officer, operating out of the Grantham Institute, to work with the APS to help implement Greening Imperial projects on the ground; liaising with leaders of 'top-down' projects initiated by the SSG in education, research, outreach etc., and adding support/coordination for the SCN-led 'bottom-up' projects from departments, institutes and students
   c. The Greening Imperial Advisory Group, also operating out of the Grantham Institute, who will support the APS, the Support Officer and the SCN with identifying leaders, identifying sources of funding and initiating projects, liaising with the Sustainability Steering Group as required.

4. An organisation chart showing the recommendation governance and operational structure of Imperial's Sustainability initiative is shown as Figure 2 in Chapter 2 of the report.

5. Resources:
   a. Imperial currently spends less than 5% of its utilities spend on energy saving and environmental projects, considerably less than all comparable UK universities. It is recommended that a target of 15% is set in order to demonstrate leadership in that particular area.
   b. The step-change in sustainability performance recommended in this report will require both financial and non-financial resources across the board. It will be the role of the APS to identify the need and priority for both types of resource and to work with the SSG initially to identify from where within the five key areas they can be provided.
   c. A variety of funding mechanisms should be explored including: self-funding (through for example energy or resource savings, requiring project lifecycle analysis and budgeting); College improvements fund; Advancement (probably best directed to transformative research and translation); Salix funds (HE Institution energy improvements scheme); London public buildings energy efficiency scheme

d. Competitive funding rounds are a potential mechanism to distribute sustainability-related funds within Imperial, as used across other HE institutions.

8.4.3 Communication and Recognition

Key Players: President, Provost, Assistant Provost for Sustainability, Co-Director of Grantham Institute (Policy and Influence), Associate Provost Academic Partnerships (Outreach)

Important Deadlines:
Upgrading Sustainability Website in time for 2018 audit by Green League in July (June 2018)
Establish an Imperial Sustainability Forum to showcase Imperial activity (Q3 2019)

Specific Recommendations:

1. Ambition: Communication of sustainability activity is authentic, clear, empowering and always up-to-date, to help build enthusiasm, motivation and trust, as well as to generate action. It is transparent and displays accountability, with messages that are inspiring, desirable, fun and persuasive, emphasising the advantages and benefits of sustainability.

2. Develop a sustainability communication plan and brand that meets this ambition.

3. Upgrade and re-brand the Sustainability website so that communication of strategy, policies, targets, initiatives and achievements is clear, simple and informative, for both internal and external audiences. Continually update highlights, improvements and successes.

4. Use this to improve visibility and awareness of sustainability policies, practices and initiatives amongst all staff and students.

5. Establish a system for staff and students to ask questions or make suggestions about sustainability, for instance on the website and using social media platforms such as Facebook and Twitter.

6. Develop an email portal for improved and regular reporting and communication of sustainability goals and achievements.

7. Produce an annual Sustainability Report for wide internal and external distribution.

8. Use the Communications and Public Affairs teams' high-quality capabilities to promote what the college does in this field to the media to establish and enhance the College's

reputation and leadership role in the economic, social and environmental aspects of Sustainability, and to engage with other stakeholders.

9. Establish and maintain through the SSG and Provost Board strong and effective communication to the College management team, to emphasise the benefits of investing in improved sustainable practices across the campuses, not only through greater resource efficiency and associated cost savings but also better health and productivity for staff and students and the College's contributions to global sustainable development goals.

10. Recognise and reward Excellence in Sustainability through a series of President's Awards

8.4.4 Education

Key Players: Provost Board, Assistant Provost for Sustainability, Vice-Provost Education, Associate Provost Academic Partnerships (Outreach), Student Union Environment Officer

Important Deadlines:
Directory of existing Sustainability related courses and content analysis (Q3 2018)
Sustainability Lecture Plan to provide courses for all students (Q4 2018; delivery Q4 2019)
Sustainability module for induction programme for all new students and staff (Q3 2019)

Specific Recommendations:

1. Aspiration: All students have sustainability and action on climate change material embedded into their courses to enable them to bring a responsible view of these issues into their future careers and integrate them seamlessly into whatever future environment they operate, be it technological, financial, social or political.

2. Short term targets, 2018-21 three-year plan:
    a. Develop a basic sustainability lecture plan in each department for a course
    b. Made available to all students
        i. Template to be created by APS and sustainability support officer in collaboration with VP Education and team;
        ii. Content produced by person associated with course;
        iii. Courses can be customised within departments or delivered at Faculty or College level (see (c) below).
    c. Incorporate sustainability into induction programmes for every new student and member of staff.
    d. Explore within the 2018 Horizons Programme review (Dr Roberto Trotta) how to get climate change and sustainability taught more effectively to a wider group of undergraduates.

3. Medium term targets, 2020-25:
    a. Review the current gaps in curricula (with support from programme and module leads) to suggest ways to incorporate more sustainability and action on climate change.
    b. At least half of departments to have an Education for Sustainable Development curriculum plan to incorporate more sustainability into their models and degree programmes.
    c. Engage alumni on sustainability education.

4. Long term targets, beyond 2025:
    a. Develop an integrated aspect for each degree programme for sustainability and climate change action, appropriate the discipline and approach.
    b. Alumni in positions of impact related to sustainability teaching.

8.4.5 Research

Key Players: Provost Board, Assistant Provost for Sustainability, Vice-Provost Research, Co-Director of Grantham Institute (Policy and Influence), Associate Provost Academic Partnerships (Outreach)

Important Deadlines:
Development of a strategic plan for sustainability related research (Q1 2019)
Bring to fruition plans for London Cleantech Innovation Centre
Sustainability research 3-year plan and budget (Q3 2018)

Specific Recommendations:
1. Ambition: Our vision is to provide research and thought leadership in the global challenge field of sustainability and climate change in order to develop deeper understanding, solutions and technology towards a zero-carbon world and enhanced natural environment.

2. To realise this vision
    a. Develop a strategic plan for sustainability and climate change related research, incorporating current strong activity across the College in this area, our strengths in multi-disciplinary research and consideration of Imperial USPs and a competitor analysis.
    b. Develop a plan for translation of current sustainability research that is suitably advanced and addresses identified societal sustainability needs.
    c. Develop a plan for the funding and investment required to deliver these plans.

3. Explore the role the Grantham Institute might play in enabling and coordinating this more integrated Sustainability Research activity.

4. Position Imperial as the key player in the development of London's Cleantech Innovation Centre.

5. Exploit opportunities within the UK political and research funding landscape
    a. Enabling the UK government to implement its Clean Growth Strategy and Industrial Strategy
    b. The availability of the Global Challenge Research Fund and the increasing multi/cross-disciplinary research focus of UKRI

6. Provide competitive College funding to stimulate new research strands in this area which exploit existing strengths, such as sustainable cities, climate change and non-communicable diseases.

7. Encourage early career researchers and PhD students to exploit their research in this area through Dragon's Den type funding or through targeted scholarships.

8. Create a specific Sustainability initiative to use the Invention Rooms at White City, particularly the Advanced Hackspace, to bring together staff, students, alumni, start-ups and commercial partners to work together to convert research ideas into practical solutions to sustainability and climate change problems.

9. Devise mechanisms and venues for demonstrating and publicising the viability of emerging sustainability-related solutions
    a. White City would be a suitable site for this and the Development Director has already expressed an interest in this.
    b. Identify partners or spin-out opportunities for translating Imperial's sustainability research into practical application.
    c. Use Communications and Innovations to ensure emerging sustainable technology has a high profile with the media and potential stakeholders

10. Work with Advancement to identify funding opportunities for donors in this area; work with them to prepare value propositions and identify funding partners.

8.4.6 Societal Impact

Key Players: President, Provost, Provost Board, Assistant Provost for Sustainability, Vice-Provost Education, Vice-Provost Research, Co-Director of Grantham Institute (Policy and

Influence), Associate Provost Academic Partnerships (Outreach), Student Union Environment Officer

Important Deadlines:

Devise sustainability activities for White City Reach Out Makerspace (Q4 2018)
Plan to showcase emerging sustainable technologies on campus space (Q4 2018)
Bring to fruition plans for London Cleantech Innovation Centre
Plan for coordination of sustainability policy engagement (Q1 2019)
Build an alumnus network in sustainability and action on climate change (Q1 2019)

Specific Recommendations:

1. Ambition: To work with stakeholder groups including technology user groups, social networks and local London communities to help make our work relevant to the needs of society, providing effective, innovative solutions to sustainability and climate change issues; to be a key advisor to governments and industries on these areas, using alumni relationships, professional contacts and opportunities to bring key decision makers to the College; to share what we do to improve sustainability with the public, particularly local communities and young people.

2. Work with Hammersmith and Fulham Council to identify and implement ways for Imperial to be a local exemplar of sustainability innovation and best practice both on the White City Campus and with the local community.

3. Through new facilities at White City, such as the Invention Rooms and its Reach Out Makerspace, showcase emerging sustainable technologies to the local community and enable local young people to work on their own solutions which address sustainability issues, from local to global, both to inspire and to demonstrate Imperial's leadership role in this field; hold community and school (fun) events to raise awareness of sustainability issues.

4. Position Imperial as the key player in the development of London's Cleantech Innovation Centre.
    a. Exploit temporary innovation spaces at White City such as ThinkSpace and the Invention Rooms as catalysts for the creation of a Cleantech Innovation Cluster
    b. Develop MSc in Cleantech Innovation and Entrepreneurship

5. Coordinate policy engagement activities in sustainability of the Grantham Institute, Centre for Environmental Policy, the Energy Futures Lab and other players in the sustainability policy space.

6. Build an alumnus network with experience in sustainability and action on climate change to engage them in both policy work and education.

7. Showcase emerging sustainable technologies by using our campus space to demonstrate and pilot new approaches.

8. Build skills and awareness of staff and students to enable them to play active roles in societal engagement.