MRC Centre for Environment and Health Sustainability Report 2020/21

October 2021

Views from students and staff members

MRC Centre for Environment and Health Sustainability Working Group

MRC centre | Sustainability Working Group

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“we [universities] have a unique role to play in finding the solutions, through our cutting-edge research, as educators, and as institutions and communities in our own right”.

Joint statement on Environmental Sustainability in Russell Group Universities

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What is in this report?

The student-led **Medical Research Council's** (**MRC) Centre for Environment and Health Sustainability Report 2019/20** is an attempt to create an instrument that can be used to cultivate constructive conversations on how we, *together*, can build a better and more sustainable research environment and university. Here, we address some of Imperial College of London's (ICL's) sustainability challenges, exploring in depth some concrete practices, and we suggest alternatives or improvements that we believe could help make the College a more sustainable institution. This report is the result of months of hard work, thorough research, and long discussions. It was created by a group of passionate students and staff members at the MRC Centre for Environment and Health[1]. The initiative emerged as a direct result of a behavioural change workshop on sustainable practises, run by one of its members in January 2020[1], supported by the Community Research Fund, from which most of the recommendations have been drawn.

The MRC Centre for Environment and Health[2] is a research centre and brings together researchers from the School of Public Health, Small Area Health Statistics Unit (SAHSU), NHLI and MD&R at the Faculty of Medicine in ICL, and from the Faculty of Life Sciences and Medicine, and the Environmental Research Group (ERG) at King's College London (KCL). Funded by the MRC and Public Health England (PHE) between 2009 and 2019, it is now exclusively funded by MRC, giving it the name **MRC Centre for Environment and Health.** The Centre aims to become a research hub on environmental and health protection, both in Europe and globally. However, there is a lack of translation of such principles into day-to-day practises within the Centre. This was a key motivation of this report and so, the MRC Centre for Environment and Health is the subject of several of our suggestions. We are aware that the MRC Centre will be moving to the brand-new White City Campus, which offers the opportunity to embed sustainable practises from the start. Unfortunately, the details were unclear to the authors and so, recommendations reflect mainly the reality at the St Mary's campus where the ICL branch of the Centre is located now. Yet, we also provide broader suggestions that are applicable to other campus, including White City Campus.

The report is structured in 7 chapters covering some of the major areas in sustainability, from waste management to capacity building. Each chapter is structured as follows. Firstly, we provide an executive summary highlighting the main findings and suggestions of the chapter. Secondly, we review the literature and provide contextualization for the importance of acting, from an environmental and social point of view. Thirdly, we assess the current practises within the university and the MRC Centre for Environment and Health when relevant. Finally, for each of the identified practises, we provide a range of alternatives and improvements based on evidence. Here we draw our suggestions from literature, previous experiences, and the feedback collected in the behavioural change workshop conducted in January 2020. We also provide, when possible, case studies showcasing its successful implementation and results.

MRC Centre for Environment and Health
Sustainability Working Group

[1] http://www.environment-health.ac.uk/sustainability
[2] http://www.environment-health.ac.uk/about-us

Preface

ICL is a world-class university with a well-owned reputation of delivering high quality education and research. Its research has been rated as high impact with an effective application on industry and enterprise. It is home to 17,000 students with more than 125 countries represented. On average, every year the College awards 6,700 degrees. In other words, ICL has on its hands the opportunity to shape the future of thousands of students and the duty to provide them with the skills, knowledge and understanding of the world to not only succeed in their professional careers, but also to have a positive impact in their communities.

Imperial has announced its commitment to sustainability on several occasions. As a member of the Russell Group of Universities, Imperial has committed to contribute to the social sustainability transformation through their cutting-edge research, education, and community. With science, engineering, medicine, and business being its disciplines of focus, ICL is producing a large amount of valuable research in relation to sustainability, environmental policy, and climate change, just to mention some. These have proved impactful and have successfully fed into sustainable practises and actions.

Despite these commitments, Imperial has repeatedly been rated poorly by sustainability performance rankings. The People & Planet's University League, which is a comprehensive and independent ranking of universities based on their environmental and ethical performance, rated ICL in the 130th position, deeming it as one of the worst universities. Over the years, there have been several expressions of concern among the student and staff community on this regard. Moreover, a recent nation-wide survey of students in the UK, showed that sustainability practises are becoming a determining factor when selecting a university to study, reflecting the growing social concerns towards sustainability. This can also be seen inside the College. Several student and staff-led initiatives have emerged over the years with the intention to improve this situation. One such example is Greening Imperial - a cross-campus and community initiative that intends to convey sustainable actions and push for change. However, these initiatives rely on collective and unpaid effort and so, are subject to fluctuations which hinder their long-term impact. The university should create a cohesive, coherent, and financially supported long-term strategy to tackle sustainability.

WE care, and we want YOU to care too

CHAPTER 1: ENVIRONMENTAL SUSTAINABILITY POLICY AND ROAD MAP

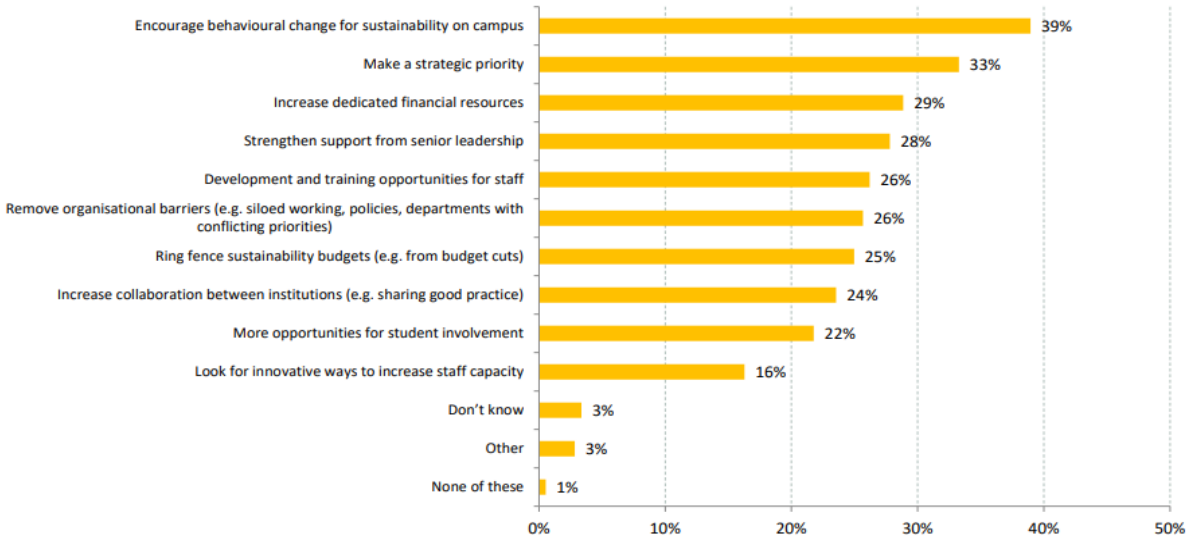
Executive summary

It is paramount that ICL recognises its responsibility to formally support a sustainable future and protect the environment. This formalization should start by agreeing on an **Environment and Sustainability Policy** with application across the College. This should not only represent the formal commitment of the College to sustainability, but it should also set ambitious but feasible goals that can be monitored and evaluated periodically to ensure the College operates in an environmentally sustainable way. Periodic reports evaluating its achievement should be made publicly available.

Why is it important?

An **Environmental Sustainability Policy** is key for any institution to recognize its commitment and define its road to actionable change. Its effectiveness results from the following: (i) it makes people liable for their actions, (ii) it transforms a belief and personal commitment into an institutional and official declaration, (iii) it reassures staff and students of the importance of sustainability for the College, (iv) it provides the space and tools to identify challenges and generate solutions, and (v) it enforces the development of monitoring and evaluation frameworks to assess the achievement of the goals.

Another key aspect for successful and transformative change is the existence of a devoted team, and a long-term and well laid out plan or roadmaps. The definition of a plan implies the evaluation of the current situation, the identification of challenges and opportunities, the definition of feasible and actionable targets within a given timeline, the definition of indicators to monitor and evaluate its achievement, which should then be used to update the roadmap accordingly, thus closing the circle. This roadmap should be made available to all the parties involved to ensure transparency and accountability of the process. Finally, for this to be effective, a dedicated team of full-time employees should be created to support the definition, monitoring and evaluation of the College sustainable practises.



Source: NUS survey Sustainability in Education 2018/9

Figure 1. Percentage of respondents of the NUS survey on Sustainability in Education 2018/19 by institutional action.

According to the National Union Students (NUS) survey conducted in 2018 (NUS survey Sustainability in Education 2018/19) on 566 staff members, 40% of the respondents emphasized the lack of financial support as a major barrier preventing them from acting on sustainability. The second most common barrier (37%) was the university prioritizing other goals over sustainability. When asked how to promote action on sustainability at an institutional level, they identified encouraging behaviour change (39%), including sustainability as a strategic priority for the College (33%), increasing the financial support (29%) and recognition from senior members (28%) as some of the key actions (**Figure 1**).

What is Imperial doing?

From the information provided by the College in their main information channels, it remains unclear whether the College has an official Environmental Sustainability Policy and if so, when this was approved. Information regarding a 'potential' policy being developed is presented on the Estates Facilities website[3], yet this often refers to future publications and no date is provided. It defines overall objectives and links to different themes such as transport or air pollution. In each theme webpage there is a document with a list of SMART (i.e. Specific, Measurable, Achievable, Relevant, Time-bound) objectives, which are broad, lack explicit definition of the planned actions to achieve them, and lack information on the timelines for their achievement.

Regarding setting up a collective roadmap, there have been several attempts to collate all initiatives and actions taken across the campus by both community-lead organizations like the Greening Imperial or the now Sustainability Academic Leader, Prof. Paul Lickiss. However, unless there is an institutional commitment and official roadmap defined, all these initiatives will be hindered.

Challenges and opportunities

Firstly, we recommend ICL to adopt an **Environmental Sustainability Policy** as soon as possible or to provide updated, detailed, and accurate information of its contents if one already exists. Having the policy is as important as it being visible to the subjects affected by it, that is staff and students.

Secondly, the College should create an **independent full-time sustainability team** committed to the endeavour of developing and monitoring the sustainability practises of the College. Currently, the College relies on the work of community-led entities and of the Academic Sustainably Leader, Prof. Paul Lickiss, who lack the support of a dedicated team and the resources to effectively implement change. This is an enormous endeavour and should not rely on volunteering of staff members and students.

Thirdly, we recommend the definition of **a College-wide roadmap to sustainability covering both short-term and long-term targets**. This roadmap should include: (i) thorough description of the College's current environmental sustainability on their educational, research and community dimensions, (ii) identification of the main overall driving aims, (iii) definition of ambitious, feasible and specific objectives, including timelines for their accomplishment, (iv) identification of the indicators used to evaluate their accomplishment, and (v) plan of action defining how the College is planning to achieve each of them and who is responsible for each. This roadmap should be made available to all the parties involved to ensure transparency and accountability of the process. In order to achieve the latter, we suggest the development of a good communication strategy that reaches out to all College members and that curates its content making sure it is up to date and accurate.

References

National Union of Students (NUS). 2018. Sustainability and Education 2018-9. Survey research by the EAUC, National Union of Students, University and College Union, Association of Colleges and the College Development Network.

[3] https://www.imperial.ac.uk/estates-facilities/sustainability/environmental-policy/

CHAPTER 2: GAINING UNDERSTANDING

Executive summary

Little or no information exists on some of the behaviours, perceptions, and beliefs with regard to sustainable development within the College community. To better understand the needs, challenges, and opportunities, we recommend undertaking a sustainability survey.

Current situation

For some sustainability impacts, we do not have a complete picture of the current situation. For example, is food waste negligible outside of catered events? Do people take home their uneaten food waste in lunch boxes? The same applies to other areas such as transport. Why are people not using public transport or active forms of transport as their mode of commute to travel to and from work?

All these questions reside at the core of the sustainability challenge, which the College has ahead. Failure to identify them will likely lead to ineffective initiatives, loss of funds and resources, and loss of momentum for a transformative change. Therefore, the College has the responsibility to ensure that all the information to understand the challenges is available before large-scale interventions are put in place. Moreover, having a comprehensive database with information on current behaviours can also serve as a baseline to evaluate the progress of any initiative put in place.

Challenges and opportunities

We recommend undertaking a **sustainability survey**. This survey should explore at least the barriers to change and provide a baseline measurement of the current situation. For the former, there should be questions aimed at identifying beliefs and perceptions around sustainable behaviours, barriers, and opportunities, as well as the commitment and willingness to welcome sustainable changes. For the latter, quantitative information on current practises should be collected, accompanied with objective observations or sample collections when possible. A clear example of the latter is behaviours in relation to food waste. In addition to questions asking how people dispose of their food waste at the university facilities, ideally, it should also include a waste audit of the specific department/area under study.

The MRC Sustainability Working Group has developed a prototype survey touching upon all the themes covered in this report. This includes some of the main questions we have considered as being essential in order to better define the strategies suggested in the report as well as general questions that can be used for future initiatives. We plan to implement the survey online to the MRC Centre for Environment and Health in the near future. This could be used as a prototype for a more comprehensive and College-wide survey. We are aware that a survey was circulated at the end of June asking for general feedback and opinion from staff members and students. The survey that we suggest here is a more tailored survey with specific questions to gain insight in the behaviours and barriers that the staff members and students face with the intention to inform future interventions.

CHAPTER 3: FOOD SUSTAINABILITY

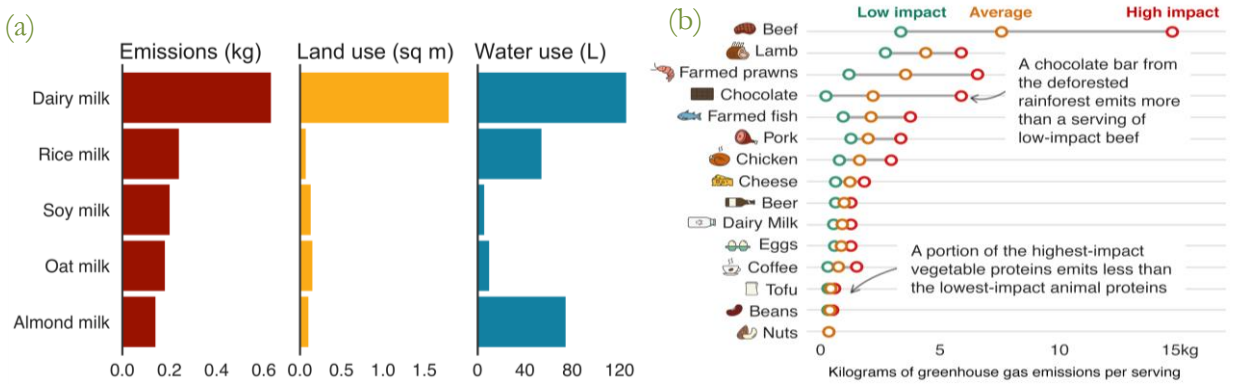
Executive summary

We acknowledge improvements have been made towards food sustainability practises. However, these are primarily centred at the South Kensington campus. Students and staff members from other campuses ask for actions to be inclusive and tailored to the needs of all campuses. We acknowledge the key role of community-lead initiatives yet, highlight the need for the College to provide financial and personnel aid, to ensure continuity and successful implementation. We propose several alternatives including providing food waste bins, reducing the price and increasing the variety of plant-based options, stopping use of single-use packaging, investing in Fairtrade and local suppliers, among others.

Why is it important?

Sustainable food is important for tackling some of the biggest current global challenges including climate change, food and packaging waste, emissions including greenhouse gases (GHG) from meat production and CO_2 from food meals, and the burden of disease caused by poor diets. Food production is responsible for deforestation, depleting stocks of species that we consume, and accounts for 70% of all human water use (Fischer and Garnett, 2016). British workers each produce 276 items of 'lunch on the go' packaging on average every year, amounting to an annual total of 10.7 billion waste items, according to a research using 1,200 UK full and part-time workers carrier out by Hubbub charity in 2019 (Hubbub 2019; Packaging News, 2019). Additionally, in the UK, food consumption accounts for around 30% of the UK's carbon footprint (People and Planet, 2020a).

The environmental impact of food varies by different food type and source. In a study on the global environmental impacts of different agricultural goods, Poore and Nemecek (2018) compared the different emissions, land use, and water use of different milk types. They found that soy and oat milk are the most sustainable as they require less land use, water use, and produce less emissions compared to dairy milk (**Figure 2a**). Additionally, they found that diets that include meat such as beef, lamb, and prawns can produce 15kg, 6kg, and 7kg of GHG emissions per serving, respectively. This highlights the need for a sustainably sourced diet, low in animal produce (**Figure 2b**).



Source: Poore & Nemecek 2018 and curated by BBC graphics

Figure 2. (a) Emissions (kg), land use (sq m) and water use (L) for 200ml of different milk types. (b) Carbon footprint of different foods in Kg of greenhouse emissions per serving.

Universities play an important part in reducing the impacts and issues caused by food consumption. In the UK they procure and provide food to over 2 million students each year (People and Planet, 2020a). Understanding students' behaviours and perceptions towards food is key for universities to implement effective and impactful initiatives. A nation-wide survey across university students in the UK found that more than half of the students were willing to make changes in their food consumption to reduce their environmental impact (National Union of Students, 2019). However, when asked about the factors affecting their food choices, the ethics, environmental impact, and packaging materials were considered by less than 15% of the students. Meanwhile, price was rated the highest, being important to more than 80% of the students (National Union of Students, 2019). These findings highlight the economic burden affecting a large proportion of students and the repercussions this has on their dietary choices. Therefore, initiatives aiming to modify students' food consumption, should take these findings into account. When flexitarian and meat-consumers were asked which actions/initiatives would most likely change their food preferences towards vegetable-based diets, they ranked availability and variety of meat-free options (72% of students), reduced priced (54% of students) and financial reward schemes (33% of students) as the top most effective.

This chapter presents the current situation of food sustainability at ICL, reviews some available alternatives and solutions, and provides successful actions as case studies.

What is ICL doing?

Situation College-wide

To our knowledge, Imperial does not have an overarching sustainable food policy and has not yet fully committed to improving the sustainability of food procured and sold at the university. In recent years, there has been a substantial effort by the College, and more specifically by the catering services to implement sustainable practises. College-centrally-managed initiatives have included the introduction of a disposable cup levy, catering waste is now sent for compost on site in a large composter, and there are plant-based options at the main senior common room cafeteria as well as a plant-based café, the Plant Works cafe. Additionally, plastic cutlery is no longer given out in the catering facilities, instead wooden cutlery and paper boxes are used for takeaway. Further, central catering services have reduced waste and single use items massively, by now using reusable cutlery, wooden trays, and sugar cubes (rather than sachets), and have reduced cling film by 90%. Finally, the College's primary food supplier has committed to mostly using sustainable palm oil.

Community-led incentives have also played a key role in shaping food sustainability practises in the College. The 'Drink, Refill, Repeat' campaign, a collaboration between campus services and Greening Imperial, involved introducing more water fountains across campuses and a behaviour change campaign encouraging staff and students to reuse water bottles rather than purchase single-use-plastic water bottles. ICL Environmental Society and facilities & property management collaboratively set up a honeybee hive in the secret garden of South Kensington campus in 2011, which produces up to 40lb of honey a summer. However successful, the lack of financial support and dedicated staff often results in discontinuity and therefore, a low impact in the long term. For example, a month of 'meatless Mondays' was trailed as part of the Greening Imperial initiative and largely met with a positive reception, however, it hasn't been made continued practice.

Despite the recent efforts, ICL still fails to meet adequate food sustainability practises. According to the People and Planet University League ranking for 2019, Imperial rated only 20% on food sustainability. This was mainly due to the lack of a structured strategy and official policy, the absence of a comprehensive and coherent framework for continual improvement and their little contribution to local and ethical food, among others.

Situation at the Epidemiology and Biostatistics (EBS) department

As opposed to South Kensington campus, at EBS there is no College-led cafeteria or restaurant where employees and students can get their food. Each department has access to a communal kitchen, yet these are often small and uncomfortable, which discourages their use. Waste bins are provided in the kitchen, which include a general waste and a dry recycling bin. Coffee and tea are provided for free by the EBS department in the kitchen. As a recent commitment to encourage healthy and sustainable behaviours, every Wednesday, two local and seasonal fruit baskets are delivered and containers returned to the suppliers, who recycle and reuse them.

Challenges and opportunities

There is a plethora of initiatives that can be pursued to help improve food sustainability within EBS, as well as at a College-wide level. While we acknowledge the existence of current initiatives, these are suggestions for further improvements, both, on a campus and departmental level.

1. Provision of sustainable, local produce and plant-based food

1.1. The current situation

The College currently offers different food services including catering services, and food in cafes and lunch halls. The former has received a lot of attention in recent years and has remarkably improved its food sustainability with the implementation of several initiatives. They have formally agreed for their primary food supplier to commit to mostly using sustainable palm oil. Another example is the addition of more plant-based food options at the main senior common room cafeteria as well as a plant-based café, the Plant Works cafe. On Tuesdays, there is a farmer's market that sells primarily local food. Finally, there is the beehive in the secret garden of South Kensington campus set up in 2011 by the ICL Environmental society and facilities & property management which produces up to 40lb of honey a summer. Unfortunately, most of the centrally driven initiatives focus on the South Kensington campus, with other campuses relying much more on self-ideated and community-led initiatives. Moreover, at an institutional level there are several actions that could be taken to formalize food sustainability and ensure its implementation is not discontinued.

1.2. Suggested actions

At an institutional level, that is across all campuses, the authors suggest the following:

- **Develop a food sustainability policy.** The College should include food sustainability in their sustainability policies and set up feasible and achievable goals for its food sustainability practises.
- **Include food sustainability in the College roadmap.** Ambitious and feasible targets towards improving Imperial's food sustainability should be defined, and its achievement monitored and revised periodically. A report should be publicly made available, regularly reporting the progress made, the reasons for missed targets and the plans to redress them.
- **Ensure a food sustainability accreditation.** We would suggest Imperial to apply for the *Food Made Good Sustainable Restaurant Association Award,* which rates universities based on the sourcing, society, and environment implications of food.
- **Obtain a Fairtrade University Accreditation.** This initiative provides reports, resources, and toolkits to incorporate fair trade practices, and allows for the university to tote the award.
- **'Bring-Your-Own' Incentive Scheme**. Offer discounts or loyalty incentives for students and staff who bring their food containers. A similar scheme is in place at South Kensington for coffee cups.
- **Provide more green and healthy options.** Environmentally friendly options, which are healthy and more sustainable, such as vegan or vegetarian options.
- **Green and healthy options should be made easily distinguishable.** All green and healthy products should be labelled and highlighted as planet friendly.

- **Meatless Mondays.** Making it university policy to serve no meat through all university cafes and restaurants on Mondays. A quarter-pound beef burger uses 425 gallons of water – and reducing just one day's worth of meat-based meals can reduce the College's environmental footprint. This initiative was already piloted by Greening Imperial and it was widely positively received.
- **Subsidising plant-based milk.** At least one version of plant-based milk should be the same price as the standard dairy milk so that no one is deterred from buying environmentally friendly options. The College could go further in putting a levy on dairy milk to direct more people towards plant-based options.
- **[EBS only] Group lunch ordering from local restaurants following sustainable initiatives.** Regular partnerships between Imperial and local restaurants or food providers can be created to help establish discount offers and ensure use of reusable packaging. A list of the food partners could be provided to the students and employees, promoting their use.
- **[campuses other than South Kensington] Pre-order and bike delivery scheme.** For campuses like St Mary's where no university-led cafeteria or lunch provider is available on site, we suggest setting up a bike food delivery system connecting the facilities at South Kensington with the rest of campuses. This would economically benefit Imperial's self-run food halls while providing an accessible option of healthy and sustainable food to all its employees and students. The delivery scheme could employ students with an economic burden.

2. Packed lunch

2.1. The current situation

The College provides sitting areas for staff and students to eat their packed food. Students are the main users of packed lunch, primarily due to the financial burden of purchasing meals every day. This practise remains largely underrepresented among staff members. This situation is magnified in campuses where no cheap or accessible food options are provided by the College, as is the case for the Faculty of Medicine. However, the level of comfort and size of these common lunch areas varies largely across departments. At the EBS department, the kitchens are too small to accommodate all the members of the department and sometimes do not even include sitting areas.

In our behavioural change workshop, the lack of space to communally enjoy lunch breaks was highlighted as a factor that encourages eating outside and therefore, discourages the use of packed lunch. Lunch break for most was regarded as a needed mental reset, which they fail to achieve in a crowded, uncomfortable, and loud common area, which in most occasions does not even have any free sitting space. The lack of time, convenience or food options were also identified as restricting factors to bringing packed lunch. Participants recognized that planning the next day's lunch also posed a hurdle. Those who sometimes bring or used to bring packed lunch, reported that the lack of variety in the prepared lunches was an important factor to push them to buy meals instead.

2.2. Solutions proposed

Considering the current situation and the findings from our behavioural change workshop we suggest:

- **Incentivising packed lunches** through a reward system for employees bringing lunches that tick all the sustainability boxes (plant-based, zero waste, locally sourced, balanced meal, etc.)
- **Recipe club** that focuses on sharing plant-based, locally sourced, minimal waste recipes. This self-run group could involve a shared document of recipes and meet once a month for a 'potluck' in which members each bring a dish to share.
- **A sustainable eating monthly blog.** This would include news and events relating to sustainable eating practises and share useful information such as recipes for packed lunch, among others.

3. Tea, coffee, and milk

3.1. The current situation

This section focuses on EBS departmental practises. EBS provides free tea, coffee, and milk for its staff members and postgraduate students. Despite this being a nice initiative, we have identified two important issues. Firstly, the tea is provided in plastic bags that are not recyclable and some people use coffee expresso pods. Secondly, the coffee, which is an important contributor to GHG emissions due to its production and transportation, is not sourced ethically nor environmentally friendly. Finally, only a dairy milk option is provided, which is the least sustainable milk choice. Additionally, milk is provided in small (1 pint) plastic bottles, which seems an unnecessary use of packaging. We recognize durability of the milk products may be a concern with larger packaging, yet other alternatives could be explored. Finally, the milk supply has been standardized and so does not fluctuate according to demand, which often causes problems both for lack of supplies and accumulation of unused milk.

3.2. Suggested alternatives

The authors propose the following:

- **Providing milk alternatives**. Departments and groups should provide sustainable milk alternatives for tea and coffee as standard.
- **Alternative milk packaging**. Ordering milk in glass bottles or larger bottles (which accumulate less plastic) can help minimise waste.
- **Avoid milk excess and waste**. Establish a system to monitor the milk demand so that requests are only placed when needed, e.g. use TeamSeer information on staff members' leave days.
- **'Get loose!'** Tea bags are responsible for the leaching of millions of microplastics into our water systems. Providing loose leaf and Fairtrade tea will help reduce the College's plastic and food footprints.
- **Subsidising plant-based milk at the College cafes.** At least one version of plant-based milk should be the same price as the standard dairy milk, so that no one is deterred from buying more environmentally friendly options. The College could go further in putting a levy on dairy milk to direct more people towards plant-based options.
- **Social events to raise awareness about food sustainability**. Regular 'alternative' tea meetings featuring plant-based milks and biscuits, and a topic for discussion on food sustainability.

4. Food-related waste

4.1. Current situation

In 2007, Imperial commissioned Imperial Machine Company (IMC) to develop the ComPod. This world pioneering system uses an IMC Food Waste Disposer to first macerate the food waste before extracting the solid fraction from the macerated waste by means of an IMC "WastePro" Dewaterer. This represents a compact, off-the-shelf solution that is scalable according to the volume of waste that requires treatment and can be immediately operated upon installation. However, this is not available widely to university users. Specifically, at the EBS department there is no separate food waste bin, and so, food waste is thrown into general waste bins and sent to incineration where some energy is recovered. More broadly, no food waste is collected in St Mary's Campus, nor by the local Westminster council. In addition to organic food waste, there are other food-related waste sources that are present in the department. For example, when tea/coffee/water is ordered from College catering for meetings, single use (though largely recyclable) cups, bottles, etc. are provided. Also, people obtaining food from external food providers often buy meal plans which include crisp bags. This adds to the non-recyclable waste in the College.

4.2. Suggested alternatives

Below we present some additional ideas to reduce food-related waste:

- **Reducing food waste production.** Set up an advertised "take home food" scheme for the MRC Centre events where people would bring their own re-usable lunch box to take food home to increase sustainability.
- **Adopt the sandwich scheme**. Reduce to half the price of all sandwiches and other packaged food that is close to the expiry date in order to promote its selling.
- **Provide reusable cutlery and tableware**. Every catered event should utilise reusable cutlery, glasses, and dishes, which should also be provided in all break and lunchrooms.
- **Community fridges**. Certain fridges can be designated for sharing food that might be wasted or thrown out. This would help reduce the amount of food waste generated.
- **Crisp packet recycling**. Imperial could promote the adhesion to existing recycling programmes. For example, Walkers has a scheme, where they pay for shipment of boxes of empty crisp packets to them for recycling (minimum weight of 8 kg per box). Based on the weight requirements we recommend working with estates and facilities from Imperial to collect crisp packets (possibly via centralised corridor bins), where they can store it until the minimum weight requirement is met for shipment.
- **Reusable towels**. Promote the use of personal cloth tea-towels and handtowels in the kitchen, avoiding the use of paper towels and kitchen rolls.
- **Food waste bins in kitchen and composting on-site**. It is important to know the volume of food waste that is possible to divert using other approaches before implementing this due to the logistical requirements. Therefore, we recommend a waste audit. Potential compositing systems include the hotbin composter, or those that use the *A. Bokashi* process. Systems that use the *A. Bokashi* process ferment input matter by specialist bacteria, that needs less time to mature than traditional compositing. As a result, greenhouse gas emissions are dramatically lowered, and little heat is produced preserving energy. The space required for this would be limited. Broadly, it would require a "wheelie bin" which could be placed at the back of the building along with a small amount of space to store a 25l bag of bulking agent. The compost could be potentially used by the Operation Estates team, the secret garden, or the Royal Parks for use in Hyde Park.

Case studies

Case Study 1: "Planetary pick" initiative by the LSHTM

At the London School of Hygiene and Tropical Medicine (LSHTM), the catering team have developed a 'planetary pick' option which is created to optimise both sustainability and health. Drawing on wisdom from the LSHTM Centre on Climate Change and Planetary Health and the Lancet 'Planetary health' diet, this is a meal or canape choice (akin to a vegan or vegetarian option) intended to support people in making more mindful and informed choices. It is on offer in LSHTM catering facilities, identifiable by the so-called 'Planetary Pick' label. This is a great example of how sustainable food choices can be supported, encouraged, and normalised; if the option is made convenient and brought to the forefront of people's minds, it is more likely to override habit.

Case Study 2: The #LongLivetheLunchBox initiative by Hubbub charity

Research by the charity Hubbub suggests the average person produces 276 items of waste from takeaway lunches per year, and that rewards can be effective for encouraging people to bring their own lunch boxes to restaurants and cafes. Designed by the Global Action Plan's youth panel, #LongLivetheLunchBox was signed up to by 100 food and drink businesses in London, Brighton, and Oxford, and involves displaying a sticker that says 'we accept your containers here' and being locatable on an interactive map telling users where the nearest lunchbox-accepting retailer is. Many also introduced loyalty cards and discounts for lunchbox users. In a similar vein, M&S' marketplace last year launched a 25p discount per meal served in the customers' lunchbox to incentivise reusable meal containers.

Case Study 3: The 50@50 scheme by KCL

This scheme was adopted in 2017/18 in order to reduce the amount of food waste generated. 50 minutes before closure, the café and restaurant put all their sandwiches that are close to their sell-by date at a 50% discount, to avoid having to throw them away.

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CHAPTER 4: WASTE MANAGEMENT

Executive summary

The authors acknowledge that the College Estates Operators have made significant improvements in the waste management stream. They have also produced reports, which critically evaluate their performance. However, the latest report dates from 2017/18, highlighted the need for more updated information. We believe there are further actions that could be put in place, especially in relation to improving the **prevention and reuse practises,** including awareness campaigns, use of alternative and more durable materials and alternatives for ID cards, the increase in recycle bins availability and strategic location, and the reduction in paper use and printing behaviours.

Why is it important?

Waste in the UK is legally defined as anything thrown or given away by a person who owns it. Sustainable waste management involves a change in the framing of the waste management hierarchy with a clear focus on elements located high up, being the prevention of waste the foremost and ideal choice (Figure 3). Before an item has become waste, it may still be fit for purpose with repair or in its current form (***prevention*** of waste). It may also be possible to reduce how much of an item is discarded as waste (***reducing*** the amount of waste) or reused for something else (***reuse*** of waste). If waste is not prevented, reduced, or reused, it is broadly handled as a stream for recycling, recovery or disposal based on its material composition.

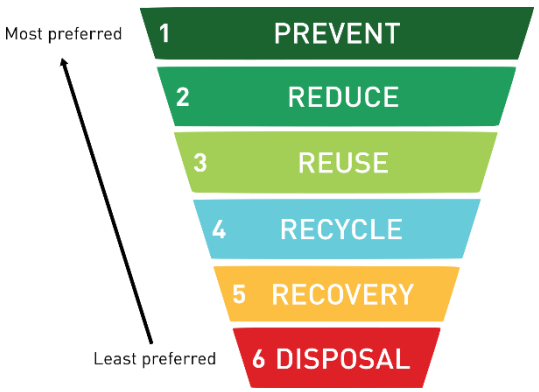


Figure 3. The waste management hierarchy and their preferability from a waste sustainability perspective.

Waste management represents a key piece in the progression to a sustainable future. As concluded in the UN Green Energy and Waste Recycling Forum in October 2019, the implementation of systems to manage waste sustainably can reduce greenhouse gas emissions by 20% per year (UN Environment Programme, 2019). In the UK, recycling has been increasing over the last decade in response to the EU 1999 Landfill Directive on waste diversion, as well as a boost in people's awareness of the environmental sustainability of recycling. By reusing a resource, further mineral extraction and subsequent environmental and climate change impacts are avoided. This results in negative emission factors for recycling of most materials and a small carbon footprint in comparison to traditional waste management practises, such as incineration or landfill.

What is ICL doing?

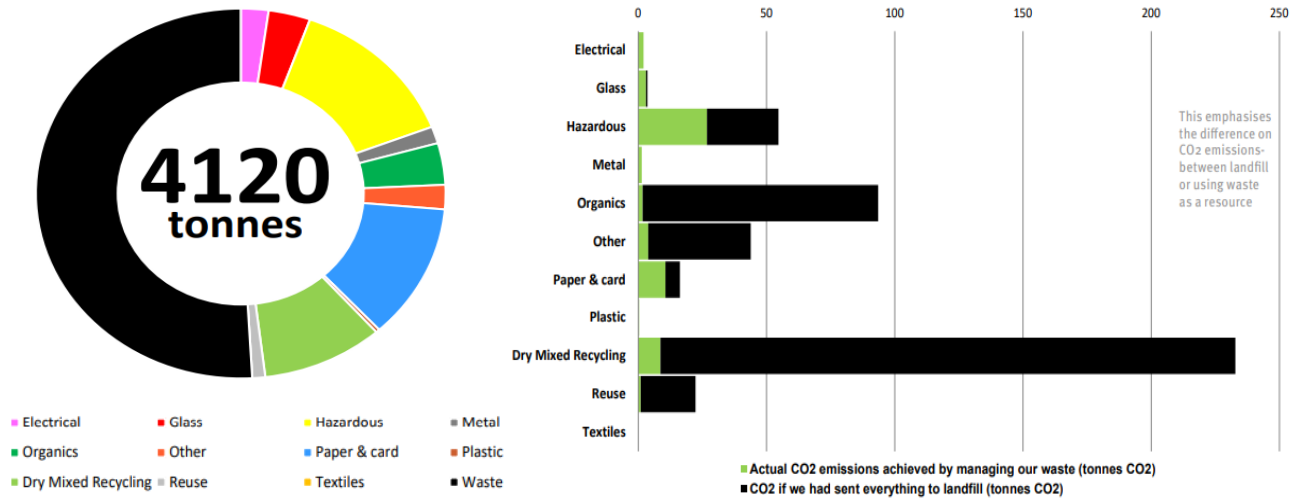
Waste produced at universities is classified as commercial waste, and therefore its collection and disposal are paid for. Collection and disposal are completed by several licensed private waste management companies or the local waste collection authority. The waste generated in the College is highly specific of the activity and facilities considered. For example, laboratories produce a highly specific type of waste that classifies as

hazardous waste, which is handled independently. In 2017/18, the College generated 4,120 tonnes of waste (Estates Operations, 2018). The most common waste type was "general waste", followed by "paper and cardboard", "hazardous waste" and "dry mixed recycling". Organic waste represented <5% (**Figure 4a**).

Progress on recycling

The College has shown the commitment to take a reuse and recycle approach with the aim, as stated on their official site, "to reduce landfill waste, to save energy, to protect the environment and to contribute to the conservation of natural resources"[4]. In 2007, Imperial underwent an extensive review of their waste and ***recycling strategy*** that led to fundamental changes. By 2010/11 the College managed to improve recycling from 19% to 40%, and this has been increasing since then. According to the latest Estate Operations report 2017/18(Estates Operations, 2018), the College has successfully relocated several waste streams away from landfills, which has translated to a reduction in the CO_2 emissions (**Figure 4b**).

Estates Operations provide a guide on waste disposal for specific waste streams in their website, including ink cartridges, e-waste, and laboratory hazardous waste[3]. For each waste specific disposal, there is a list with the items that can and cannot be disposed of, the person in charge, and the location of the bins. A waste hierarchy diagram with the percentage of waste reused, recycled, used for energy recovery, incinerated, and dispatched to landfill is provided in the website too.



Source: ICL Estates Operations Carbon management & sustainability activities Report 2017/8

Figure 4. (a) proportion of waste by type, and (b)CO_2 emissions resulting from treatment of different types of waste by landfill (black) and self-management (green).

Progress on reusing

The College has also supported community-led initiatives ***encouraging reuse of objects***. The "end-of-term reuse scheme" is popular amongst undergraduate and postgraduate students. Set up in 2009, it gives students the opportunity to donate any unwanted or not needed item when the end of summer term approaches. All the donations go to the British Heart Foundation, except for food, and duvets and pillows which go to the Felix Project and the Better Reuse entities, respectively. In the weeks prior to the end of summer term, collection points are temporarily set up across the campus and residential halls. Similarly, the British Heart Foundation has four permanent collection points for textile and shoes donations across Imperial facilities. The College also supports reuse of furniture, stationery, and unused printer cartridges through their online redistribution network, Warp-it (Waste Action Reuse Portal)[5]. The exchange is limited within the university and it helps to reduce waste disposal and purchasing costs of departments.

[4] https://www.imperial.ac.uk/estates-facilities/buildings/services/waste-disposal/
[5] https://www.warp-it.co.uk/company/imperial

Changing behaviours

In a nation-wide survey on UK students, when students were asked what, if anything, would persuade them to start recycling more, they identified the following as important whilst on campus: availability of more recycling bins (52%), in conveniently placed locations (47%) and offering a wider range of materials recyclable (38%) (NUS and SUEZ, 2018). These statistics are in line with the feedback we received from the MRC Centre for Environment and Health behavioural change workshop. There, both students and staff highlighted the need for more specific waste bins and for those to be in better locations.

Challenges and opportunities

After an initial scoping review, we have suggested some initial improvements to the Centre's waste sustainability. The suggestions are structured around the disposable use of plastic ID cards, paper waste and printing, food and associated waste, and a more comprehensive adoption of the used item exchange. Each of the actions is presented in the context of the current situation and several options are outlined with different degrees of commitment and impact.

1. Use of ID cards

1.1. Current situation

Every student and staff member, both permanent and temporary, receive an ID card to allow their access to the faculty. The faculty of Medicine alone has a total 6,690 card holders, while the College total amounts to 26,958 (see **Table 1**, ICL Statistics Guide 2019). This is an estimate of active cards as per year 2018/19. Every year, new members join, requiring a new card to be issued, which implies a sustained annual increase in the number of cards being issued. In addition, new cards may need to be issued in the event of lost or stolen cards, adding to that amount.

Cards are composed of plastic and magnetic chips; both are materials difficult to recycle. Most cards (unknown for Imperial) have a high content of PVC, which is not biodegrade. In addition, they emit greenhouse gases when burned, and their underlying material (vinyl chloride) as well as other additives when burned could have negative impacts on health.

Table 1. Official number of staff members (permanent and temporary) and students (undergraduate, postgraduate) across the College and in the School of Public Health.

2018/2019	Faculty of Medicine	College total
Staff		
Academic staff	450	1,303
Research staff	1,012	2,428
Support staff	1,114	4,056
Total staff	2,575	7,786
Students		
Undergraduate (UG)	2,188	10,055
Postgraduate (PG) Research		
full-time	792	3,650
part-time	276	423
total	1,068	4,073
Postgraduate (PG) Taught		
full-time	385	3,864
part-time	474	1,180
total	859	5,044
UG/PG Total	4,115	19,172
TOTAL	**6,690**	**26,958**

Source: ICL Statistics Guide 2018/19

1.2. Suggested alternatives

Some alternatives that are available in the market are:

- **Digital identity/ app.** According to the UK Government definition "digital identity is information used by computer systems to represent a unique person, organisation, application or device. So, for a citizen or consumer, a "digital identity" is a trusted way of proving one or more attributes about themselves online or offline and the linkage of those attributes to that same person as a uniquely identifiable individual". We propose the development of an ID app for personal identification across the College. This could be an added feature of the 'Imperial Mobile' platform. The new ID app could be piloted on students, giving them access to general College facilities including the Library and Ethos. This would be a great way to test the reliability of the app before ruling it out extensively. See the case study provided in the section below.
- **Biodegradable cards.** There exists a growing market for biodegradable cards. This could be an option if it is coupled with an adequate waste collection and treatment system.
- **Reusable cards.** Disposable cards generate waste, while reusable cards can be reprinted for up to 500 times. The cards are made from special temperature sensitive materials that respond to the heat of the printer. Rewritable cards are only able to print in monochrome blue or black, and also come in magnetic stripe form. This option is especially suited for visitors due to its temporality. Special printers would be needed for this purpose.
- **Simplify the cards.** We suggest two simplifications of the cards: (i) a reduction in the size which would significantly reduce the amount of plastic waste being generated, and (ii) the removal of all printed content including image and text to facilitate its recycling. This action would require the smallest financial and infrastructural investment. The need for images for security reasons could be made redundant by a sufficient database accessible by security and personnel when the card is used.

2. Recycling bins in offices

2.1. Current situation

Offices across the College have at least one multipurpose bin and in the worst cases a bin for each desk in the room. These bins are replaced periodically by the cleaning team, translating into a redundant waste of plastic bags. Moreover, employees and students may use those bins for any type of waste they may generate in the office (from food waste to used paper) due to proximity and convenience As a result, the content needs to be treated as general waste despite the high proportion of dry recycling (i.e. paper waste) in it. Despite this being sent to a waste management plant that generates energy based on its incineration, the consensus is that preventing, reusing, and recycling are preferable (see **Figure 3**).

2.2. Suggested alternatives

- **Join the Imperial initiative 'bin-the-bin'.** 'Bin the Bin' is an initiative that promotes the removal of all desk side bins and the upgrading to blue recycling bins partnered with black general waste bins[6]. According to their official website "the initiative has already been adopted by various areas of the College including the Faculty Building. This initiative has been very successful." We suggest the launch of a campaign to promote its implementation to all departments.
- **No bins for small offices**. Offices not big enough for a double bin system should have no bin at all so that their occupants would have to use common areas, which should be equipped with a double bin system. See case study below.

[6] *https://www.imperial.ac.uk/estates-facilities/buildings/services/waste-disposal/initiatives/bin-the-bin/*

3. Reduce paper waste

3.1. Current situation

Currently, undergraduate students are given an annual minimum print allowance of £25. This print allowance is renewed automatically at the start of each academic year. Postgraduate print allowance varies according to departmental regulations as stated by ICL's official website. With regards to staff members, they are "given an unlimited printing allowance" which is "...billed to [the staff member's] department at the end of the month". Therefore, there exists a lack of control over the printing practises among staff members, and to a lesser extent among postgraduates depending on the departmental regulations in place. Moreover, the lack of printing allowance may indirectly create a subliminal message of acceptance and promotion to printing.

In relation to the type of paper used, this differs by department with only a few using recycled paper. Recycled paper is better for the environment as it helps preserve forests and conserve resources, as it reduces demand for wood and it generates less pollution during manufacturing, because the fibres have already been processed once. It also reduces waste generation as it diverts usable paper from the waste stream. In addition, white bleached paper uses chemicals with detrimental environmental and health effects.

The College holds several printer cartridge recycling locations collected by the Soft Services Support Team (South Kensington) or cleaning team (elsewhere) and picked by a specialist recycler. The items are cleaned, refilled, and re-used (or recycled where this is not possible). However, not all departments have such collection points and not all collection points seem to be stated in the website. In addition, the ink used for printers could also be sustainably sourced (e.g. soy-based ink) rather than petroleum-based inks, which are the commonly used ones and are less sustainable. Finally, another source of concern is the printing habits. Printing remains a common practise among our staff and student community. This is encouraged by the lack of restrictions mentioned above. A lot of the printed documents are unused and or used only temporarily before they become disposable (e.g. meeting agendas). These prints end up in the bin, often not being recycled.

3.2. Suggested alternatives

We propose the following actions:

- **Scrap paper box.** A box should be placed next to the printers and/or in each office to facilitate paper re-usage. This would give a second life to the short-life prints.
- **Awareness campaign.** This should focus on the need to reduce printing and paper usage. This would have an impact on the amount of paper and ink waste generated, as well as the energy consumed for printing.
- **Recycled paper and sustainable ink.** Currently, several departments have already moved to recycled paper; this should be extended across the College. Despite the rapid adaptation in the use of this type of paper in several contexts, there remains some stigma around it and in some contexts, recycled paper is still regarded as unprofessional. Therefore, the use of recycled paper should come with a statement announcing this as the official paper adopted by the College in all circumstances, including for official documents. In addition, alternatives to the petroleum-based ink could be explored in order to further reduce the environmental impact of printing.
- **Printing allowance.** Staff members (and postgraduate students if it applies) should have a printing allowance, similar to that for students. This allowance should be low, in order to promote digital platforms rather than printing.

4. Used item exchange

4.1. Current situation

Not everyone is aware of the Wrap-it used item exchange platform. This potentially has people buying resources, which they could get for free and increases our environmental footprint due to excess production.

4.2. Suggested alternatives

- **Better advertise the "warp-it" platform**
- **To run "warp-it" sign up and training sessions**

5. Awareness campaign

5.1. Current situation and environmental impact

The extent to which everyone is aware of the environmental impact that the MRC Centre has from individual behaviour to institutional practices is unknown. However, there have been several community and departmental attempts to bring to everyone's attention our responsibility to be accountable for the MRC Centre's sustainability practises. An engagement campaign to encourage adoption of behavioural change is also essential to many of the proposed actions. Furthermore, the likelihood of institutional change will be increased through increasing awareness of these issues, which will hopefully lead to conversations between people at the MRC Centre.

5.2. Suggested alternatives

Undertake a sustainability impact awareness and engagement campaign across all sustainability dimensions outlined in this report. This should not be based exclusively on sporadic campaigns as it is now, but instead relying on setting up a coherent and long-term strategy and communication platform. As part of this platform we suggest some actions:

- **Biannual emails** on the sustainability committees progress issues
- **Annual reports** on the MRC Centre's impacts which are designed for all audiences
- **Factsheet with actions** that people can take to reduce impacts
- **Visual presentation of results to improve understanding and engagement.** This could include creating a common graphical language for different media and communications. This would be a substantial undertaking and ideally through a dedicated graphic designer or use existing resources.
- **Collaboration across departments, city-wide and national initiatives.**
- **Social events to test people's knowledge on waste management (e.g. quiz)**

We could use the MRC Centre for Environment and Health to pilot some campaigns we can have influence in creating. This way we can pool resources and get support for graphic design.

Case studies

Case Study 1: Digital cards iDly - University Trinity College, Dublin[7]

Trinity College Dublin ID app was developed by students Peter Meehan and Conor Brennan over Summer 2015 as interns in Trinity's School of Computer Science and Statistics (SCSS) under the direction of Professor Stephen Barrett, and in collaboration with Trinity College IT Services (project led by Dr Tom Hayes). The app was built based on the results of an SU survey regarding students losing or forgetting their student card. The ID app can be used across the College to access the Library, Sports Centre and more without a physical student card.

[7] https://trinitylive.tcd.ie/

Case Study 2: Office bin system - King's College

To reduce bin contamination and maximize what is recycled, KCL removed all single desk general waste bins and replaced them for a unique double system of bins. Where the office was not big enough, a shared bin was placed in a nearby corridor to be shared by more than one office.

Case Study 3: Litter Less campaign - Foundation for Environmental Education[8]

This initiative was launched in 2011 by the Foundation for Environmental Education (FEE) and Mars Wrigley Foundation and has seen more than 3million students from 5,000 schools take part. They provide the training and tools for students to develop litter action plans and media campaigns which aim to tackle specific litter and waste issues.

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[8] https://www.ecoschools.global/about-the-campaign

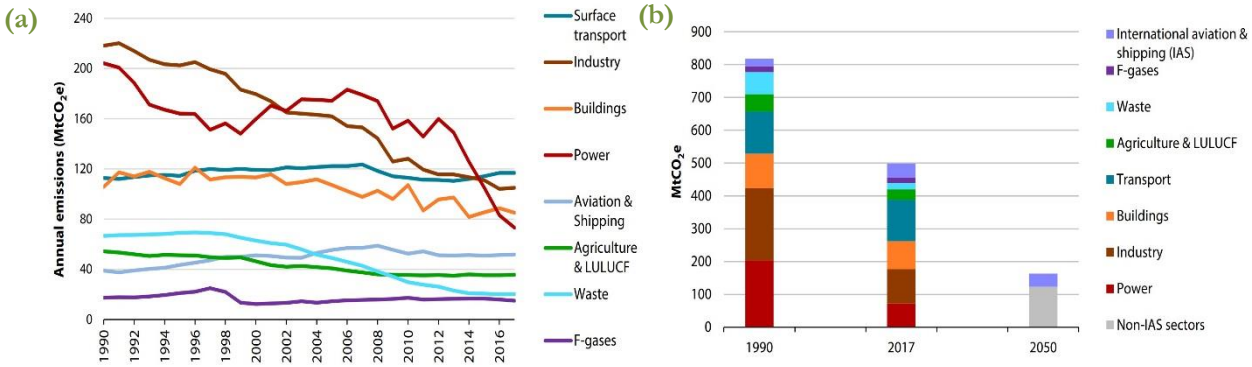
CHAPTER 5: ENERGY AND EFFICIENCY

Executive summary

ICL has seen a fall in emissions from electricity supply by over 15%, largely due to the UK's changing energy sources and a new reliance on the College's Combined Heat and Power (CHP) system (ICL, 2018). We suggest **implementing actions to improve the way energy is used by students, staff, and visitors**. Vital work is being carried out regarding building infrastructure and energy use, however there are inconsistencies between campuses and buildings.

Why is it important?

Energy expenditure is a large contributor to individual and institutional carbon footprints; in the UK, the energy sector accounts for 25% of the country's annual emissions (BEIS, 2016). As of the 2019 report, emissions from buildings have fallen by 13% since 2013 and are around 20% below 1990 levels (**Figure 5a**); however, there is still scope for improvement. The UK Government has set ambitious goals to reduce the country's carbon footprint by 2050. As demonstrated in **Figure 5b**, there is a planned ~65% reduction between 2017's carbon footprint and that of 2050, which will require many changes in energy use and building infrastructure.



Source: BEIS (2019) Final UK greenhouse gas emissions national statistics 1990-2017; CCC analysis.

Figure 5. (a) Annual emissions of different industries in the UK between 1990 to 2017; (b) The change in greenhouse gas emissions from 1990 to 2017 and the scale needed to achieve the current 2050 target. †LULUCF=land use, land use change and forestry

What is Imperial doing?

The energy consumption of the College varies across campuses, with South Kensington being the one consuming the most (81%). St Mary's, where the MRC Centre for Environment and Health is located, represents 5% of the total College electricity consumption (ICL, 2018).

ICL has a history of committing to energy reducing practices across the campus. The College's Carbon Management Plan had a 20% reduction in CO_2 emissions from 2008 levels by 2014, and incorporated a Continuous Optimisation (ConCom) programme, which examined, identified, and pursued improvements in individual campus buildings' energy efficiency. In 2013, ICL won the Continuous Optimisation of Plant and Services Award at the S-Lab awards for safe, successful, and sustainable labs. ICL also enlisted the help of ABS consulting to enhance the performance of their air handling and ventilation systems of the Flowers

Building using a 'night set-back' plan that successfully reduced electricity consumption (Cope, Nov 2009). Imperial's changes in the last five years have led to:

- A drop in the electricity use per capita for staff and students combined dropped from 4,926 kWh to 3,883 kWh, from 2013/14 to 2017/18, respectively – a 21% decrease.
- A reduction of the average emissions per square metre of space from 0.160 TCO_2 e/m^2 to 0.108 TCO_2 e/m^2 from 2013/14 to 2017/18, respectively – a 33% decrease.

Imperial has also committed to upgrading its energy and water systems. In South Kensington, most of the electricity (77%) comes from the CHP system, which was upgraded in 2017, resulting in reduced emissions by ~2,000 TCO_2e for the following year. In 2017, the Medium Temperature Hot Water (MTHW) network was extended beyond the South Kensington campus to the Eastside and Southside Halls of Residence, removing the need for local gas boilers. The Sherfield, and Electrical and Electronic Engineering buildings also had their Domestic Hot Water System (DHW) upgraded, making them more efficient, reliable, and capable of utilising heat waste from the CHP engines. Utilising heat waste from the CHP system has saved 166 TCO_2e emissions per year.

In recent years, Imperial has also installed over 1,100 smart meters which measure electricity, gas, heating hot water, steam, power, heat quality, water temperature, and flow rates at 15-minute intervals. The College is also utilising a Building Energy Management System (BEMS), which is used to operate and monitor Heating, Ventilation, Air Conditioning (HVAC) and lighting, and help optimise energy efficiency. Furthermore, the new buildings at White City, are being built to higher standards of energy efficiency and are following the Building Research Establishment Environmental Assessment Method (BREEAM) with aims of achieving either 'Very Good' or 'Excellent' ratings. On the People and Planet University ranking system, Imperial's Energy Sources were the second highest scoring category at 62.5%, demonstrating the university's commitment to green energy. Finally, new and efficient electrical systems have been promised in the newly designed buildings at the White City Campus.

Challenges and opportunities

1. Laboratory electricity efficiency

1.1. Current situation

Laboratories often consume 3-10 times more energy per square metre than academic spaces, and hence have a significant impact on our planet, ranging from energy and resource consumption, to chemical and equipment use and disposal. In a typical research institution, labs consume 60-65% of the total energy. It is therefore vital to optimise energy consumed by labs in order to have a safer, sustainable and more efficient lab. The figure below (**Figure 6**) shows the average daily equipment energy consumption.

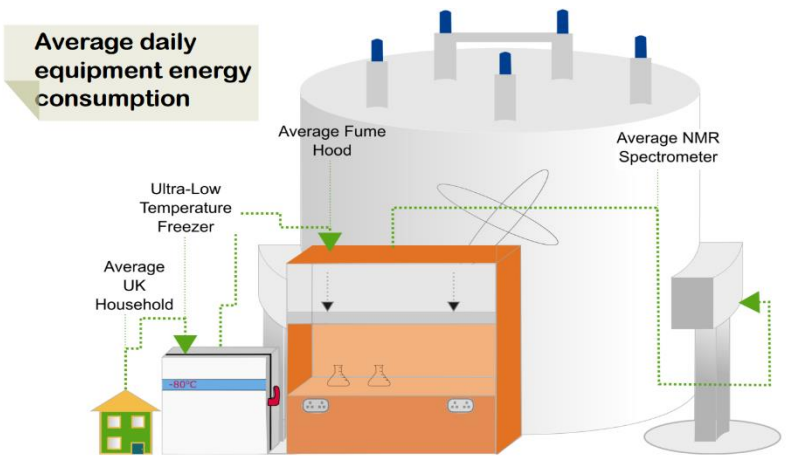


Figure 6. Average daily equipment energy consumption described in reference to the average UK household energy consumption using proportion in size as a visual equivalent.

Source: LEAF and lab sustainability, KCL 2019

Starting this year, ICL has been advocating lab participation in the LEAF program for lab sustainability, which was piloted in 4 Imperial labs in 2019. Currently, there are 30 labs which have registered interest in the scheme.

1.2. Suggested alternatives

We suggest the following:

- **Make participation to the LEAF program mandatory for all laboratories**. This would help ensure that laboratories run in the most efficient and sustainable way.
- **Training** staff members and students on efficiency procedures would also be advised.
- **Keep the fume hood closed when not in use.** Often fume cupboards are the largest energy users, since they use extraction fans, which are constantly running and may have been heated or cooled to suit the lab. Hence, these must be turned off when not in use.
- **Set up an exchange system for internal (within the College) and external laboratories for excess chemicals.** A system to ensure quality should be also put in place.
- **Manage chemicals by ordering and using appropriate quantities.** Check for stock, before placing a new order. We are aware that the Chemical Department's laboratories are testing a new software to manage chemical stock that could be applied across all laboratories in the College.
- **Ensure that freezers are running well, defrosted, and samples are managed**. Do not leave the freezer door open longer than necessary and consider running at -70°C (25-30% energy savings!).
- **Power down whenever possible**, for example overnight, weekends or building closures for maintenance.
- **Water must be used efficiently**: recycle water where possible and glassware must be cleaned by soaking (instead of a running tap), which is more effective.
- **Lower brightness, having monitors sleep** when not in use, and reducing the number of monitors are some ways to optimise energy consumption. Computing and IT is essential in all labs and can be responsible for significant energy consumption.
- **Use plug-timers** to ensure that devices not in use are not using energy (see **Case Study 3**).
- **Engage with building estates to improve fume cupboard flow rates** to optimise ventilation and introduce recirculation where possible.

2. Changing behaviours

2.1. Current situation

Electricity inefficiency is often regarded as a structural problem which results in a lack of accountability by the users. This translates to careless behaviour being common, for example, leaving the lights on or not turning the computers off.

2.2. Suggested alternatives

We suggest the following:

- **Awareness campaign** to promote energy efficiency behaviour.
- **Produce a "10 tips on how to reduce energy loss" leaflet** or poster to put up in all departments.
- **Include energy efficiency as part of the taught lab courses.**

3. Small-scale infrastructure changes

3.1. Current situation

Below we provide some ideas of small-scale changes in the infrastructure and facilities that could help improve the energy efficiency of Imperial's buildings. Despite these being purely structural changes, it is important to communicate, publicise, and involve the university community to ensure adequate use.

3.2. Suggested alternatives

Based on staff members and students experience and observations, we suggest:

- **Installation of LED lighting**, which can lead to a large reduction in lighting energy consumption. Co-benefits to the lighting replacement are improved light levels and better light distribution in rooms, creating a better look and feel for building users.
- **Turning off lights and electrical equipment when not in use**, which can include the use of timers or motion detectors, as well as more.
- **Using the stairs instead of lifts.**
- **Use the rotating doors at building entrances if possible.**
- **Discourage use of personal appliances**, e.g. heaters and printers, which use large amounts of energy.
- **Have a comprehensive shut down plan** to ensure that all lighting and equipment is switched off when not required, especially at night and during weekends or holiday periods. This should include: all standard electrical equipment; vending machines; water coolers; fridges (where applicable); computers, monitors and all peripherals. This plan needs to be communicated before holidays such as Christmas, Easter & Bank Holidays. ICL IT services can manage the computer remotely efficiently, as demonstrated during the lockdown. Therefore, easing the implementation of such system. Long-term unused computers could be used for communal use in a parallel system to run tasks.
- **Have an easy and responsive maintenance reporting system.** The response in the current system is often delayed which can cause problems.
- **Use double-glazing on windows** along with shades where necessary.
- **Use window blinds during the winter** to keep rooms warm and during summer to aid with cooling.
- **Improve the efficiency of Heating, Ventilation, and Air-Conditioning (HVAC) systems.**

Case studies

Case study 1: Lighting more for less - KCL

Energy efficient LED lighting is being installed in various locations in Franklin-Wilkins Building and New Hunt's House, leading to a reduction in lighting energy consumption of more than 50%. KCL is working in partnership with Bouygues Energies and Services to reduce energy costs and carbon emissions at Franklin-Wilkins Building and New Hunt's House, where over the last five months there has been a large-scale programme of lighting replacement from fluorescent to LED. This project is forecast to save over one Gigawatt hour of electricity a year (1,000,000 kWh). This is equivalent to powering 260 average UK homes every year[9] amounting to 469 tonnes of carbon dioxide, representing 4% of the building total, which contributes to KCL's target to significantly reduce carbon dioxide emissions. The significant energy cost savings will benefit future investment in student and staff experience.

[9] An average UK home uses 3,889 kWh per year: Source: https://www.gov.uk/government/statistics/energy-consumption-in-the-uk. 2017 update.

Case study 2: Savawatt Installation[10] - KCL

Envision Concepts has developed a patented, Salix approved device called a Savacontrol, which can match motor needs to energy output in any equipment with a compressor (i.e. fridges and freezers), and in doing so achieve energy savings. They are easily installed at the plug-level and can last for 10+ years. Previously KCL had already organised an installation of such devices where appropriate (buildings with higher voltages, above ~230 volts) with some success. Fridges with the devices attached showed ~14% reductions in energy consumption. This year the goal was to complete a wide-spread installation to target areas in the Guys Hospital and Denmark Hill campus.

The project was a success as a large installation tallying approximately £38,000 was organised and managed by the Sustainability department with an estimated 2.4year payback period. 584 refrigerators, -20°C freezers, and walk-in cold rooms had devices fitted (mostly fridges and freezers) throughout research spaces, as well as one sports facility. To improve payback, areas with particularly high voltages were targeted (e.g. some areas surveyed were found to be running at 246 volts!). There were no reported break downs or equipment failures associated with the installation, although it did highlight pre-existing issues with one cold-room. To avoid researchers removing the devices, they were closely consulted about the installation. To avoid waste of a savawatt device, they were fitted where possible with stickers with contact information to the sustainability department to ensure that if the fridge was replaced, a suitable replacement could be fitted.

Currently, this remains an easy and tested method to achieve energy savings in research and cooking spaces where fridges and freezers are common. With an estimated ~£15,000 saved annually in energy and a 10+ lifespan of savawatt devices, this system can deliver significant energy and cost savings.

Case study 3: Timers installation[11] - KCL

While not applicable to all equipment, a simple solution to this would be to apply plug-in timers to certain devices. At the end of 2014, the Sustainability department purchased 50 7-day digital timers for installation in laboratories. 7-day timers were preferred to 24-hour devices as permitted further flexibility to reflect the variable working schedules of the research community. Timers only cost ~£6.20 per timer bringing the cost to ~£315 in total. Devices targeted had to be of a specific nature – ie. equipment that did not house live samples overnight, no fridges or freezers, and nothing that potentially need to be run overnight. Incubators of any sort were not suitable for installation. Drying ovens, cabinets, and heating blocks commonly left on were prime targets for such timers. Water baths are commonly left on in research spaces and can consume between 1-3 kWh per day. While they consume low amounts of energy, it was calculated that a water bath left on for just ~25 days could pay back the cost of a timer. Thus, water baths were suitable for timers. Note a typical timer should have a lifetime of 5 years minimum.

There were a few lessons learnt from the project. Firstly, not all the timers purchased worked perfectly and so, regular checks were needed. Collaboration with users was needed to ensure the times set accommodated the needs. Finally, regular updates on timer usage are needed in order to assess its acceptance, for example a timer may frustrate a user and get unplugged.

Overall 50 timers were bought, and 45 of them worked in the end. Of those 45, the estimated savings were ~£3,100 per year. KCL may have to look for new targets for some of them, as some of the drying cabinets they were applied to are being replaced with newer insulated cabinets with timers built in, but from such a small investment it seems an easy win for research spaces!

[10] Martin Farley, Sustainable Laboratories Project Coordinator, Oct. 2015
[11] Martin Farley, Sustainable Laboratories Project Coordinator, Aug. 2015

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CHAPTER 6: SUSTAINABLE TRANSPORT

Executive summary

Transportation is an essential part of life at a university for each student and staff member: from the daily campus commute to international travel for collaboration in meetings or conferences. While some people can commute via active transport i.e. walking or cycling, the majority use a combination of inactive transport modes i.e. private car, train, and/or bus.

We recommend the introduction of Transport for London (TFL) 18+ Student travel cards and a similar discount for staff members; provide a campus map for charging electric cars; improve website and engagement, and better understand students' and staff members' commuting challenges and needs.

Why is it important?

Transportation is an essential part of life at a university: from the daily campus commute to international travel for collaboration and events i.e. conferences. While the university campuses are accessible to its community members via active and inactive modes of transportation, there are opportunities to implement policies that will improve efficiencies and reduce pollutant emissions.

Most of the staff and student population at ICL use a combination of inactive transport modes via private cars, trains and/or buses, during their home-to-campus commute. All modes of inactive transport have their associated emission profiles releasing harmful gases i.e. nitrogen oxides (NOx) and particulate matter (PM) such as black carbon, which have been found to impact environmental and human health.

The transportation industry is the fastest growing contributor to global greenhouse gas emissions, producing ~23% of carbon dioxide (CO_2) emissions when compared to other industry sectors (**Figure 7**).

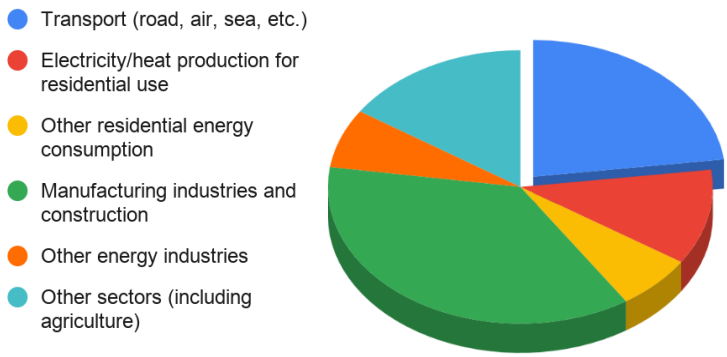
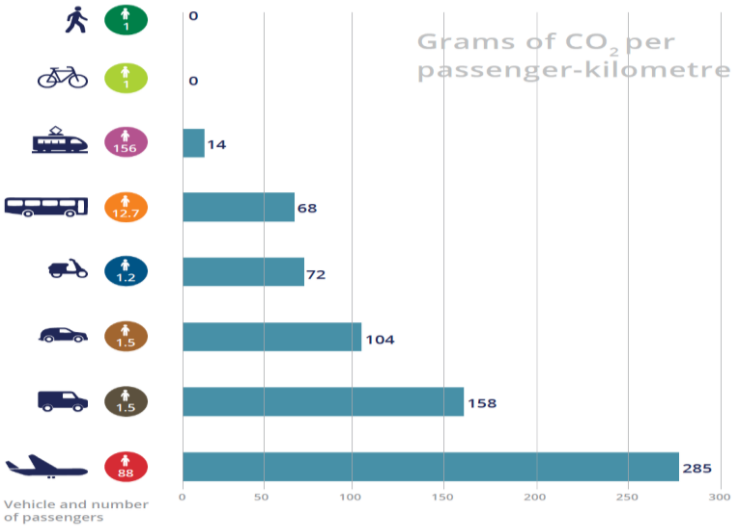


Figure 7 (Edited by authors). Carbon dioxide emission breakdown by industry sectors. Source: WHO, 2008.

According to a student survey conducted in 2013(ICL, 2013 a, b), the main modes of transportation during an ICL commute, used either singularly or in combination, are the London Underground, National Rail services, bus, private vehicle, cycle, and/or walk. The majority of the staff and student population at ICL use a combination of inactive transport modes via private cars, trains and/or buses, during their home-to-campus commute (ICL, 2013 a, b). Private vehicles commutes using cars or motorbike commutes are among the highest CO_2 contributors of the listed modes of transport (**Figure 8**). Private vehicle usage differs between student and staff members, being with staff members are more likely to commute individually, while students are more likely to lift-share with at least one other person.

Figure 8. The carbon dioxide (CO_2) emissions per passenger-kilometre for varying active and inactive modes of transportation. The CO_2 emission profile is calculated using the estimated amount of CO_2 per passenger/kilometre per transport mode based on the average number of passengers each mode can accommodate (EU, 2015). **Source: EEA, 2013**



Private vehicle usage is inescapable for organised recreational sports being that most, if not all, sporting activities require the usage of transport to practice or competition locations. ICL sporting teams that require long-distance travel often use privately hired mini buses to transport members to their event. Therefore, participating in sporting events in a bid to increase one's physical and mental health can result in an increased carbon footprint (Riekkinen and Burns, 2018). Airplane transportation, hypothesised to contribute the largest percentage of CO_2 of all transportation modes, is another example of superfluous emissions. Yet, no information is publicly available to analyse how to curtail such means of travel by ICL students and staff.

What is Imperial doing?

For the university to see a change in transportation-related emissions, improvements to transportation policy should cover a wide range of topics including transportation type, individual vs. shared vehicles, public vs. private modes, and fuel efficiency. There are several current initiatives that have been implemented by ICL to promote sustainable transport (**Table 2**); yet, sufficient publicity for these initiatives is lacking.

Table 2. Description of transportation initiatives currently ongoing at ICL.

Transport Initiative	Description
Perks for Cyclists	Cycling is about as sustainable a means of travel as you can get! Therefore, ICL provides showers for cycling commuters, bicycle storage, free work stands and workshops. ICL offers services to help university members park safely, ride safely and keep your bike secure while on campus. In addition, interest-free loans for purchasing bicycles i.e. iCycle (ICL, 2019) are available.
Student Oyster Cards	Full time students can obtain an 18+ Student Oyster Card through TFL (TFL, 2020).
Imperial Car Club *[potentially outdated]*	The car club gives students and staff access to a fleet of cars and electric vehicles conveniently parked on campus. The cars can be used for business or leisure purposes and membership is free for life (ICL, 2013).
Accommodating for electric cars	Provision is in place to accommodate electric cars at our sites, with free re-charging facilities provided
Campus Shuttle Bus	A shuttle bus service is available for students and staff, providing free transport between the South Kensington, White City and Hammersmith campuses on weekdays. Each coach offers free WIFI available on board (ICL, 2020).

Challenges and opportunities

1. Collection of thorough data profiles

To combat the usage of private vehicles and flying, and to incentivise active transport or more sustainable means of inactive transport, it is necessary that more in-depth data be regularly collected on commute and travel requirements of ICL members. This will allow for the generation and implementation of robust transportation policy targeted to meet the needs of the ICL community, as policy suggestions based on the 2013 Travel survey would be erroneous. For example, in the 2013 Survey when asked if improving inter-campus teleconferencing facilities would reduce their travel between sites, 73% of participants said it would not. It is unclear if this is a result of technological limitations of the time or if survey participants did not often use inter-campus services such as labs or libraries. The collection of a more in-depth survey to understand the commuting behaviours of the ICL community would not only address unmet research questions, but could allow for the following quantitative and qualitative analyses:

- Understanding seasonal variation with regards to commuting style.
- Developing a cost analysis framework for mode/modes of transport.
- Investigating public perspectives of transport and pollution.
- Illustrating the publics' understanding of exposure in the underground vs. cycling.
- Identifying a rationale as to why certain modes of transport were chosen vs. others.

2. Student travel cards

Upon student enrolment, the university requires personal information identical to that required for award of a TFL 18+ Student travel card (TFL, 2020). Therefore, to incentivise new members of the ICL student cohort to use public transport methods, it is recommended an 'opt out' scheme be implemented in which all new members of the ICL community will automatically, upon registration, be supplied with a TFL 18+ Student travel card (TFL, 2020).

3. Active transport alternatives

Existing research supports that an individuals' increased usage of active transportation produces positive physiological effects that outweighs the negative implications of increased exposure to ambient pollution in London, United Kingdom (UK; Tainio et al., 2016). Therefore, distributing information to ICL members upon arrival on the location of TFL cycle routes could increase the number of individuals interested in cycling. As in the 2013 Travel survey, one of the main reasons for individuals not wishing to use active modes of transport was the condition and frequency of cycle routes and paths. The cycle routes since 2013 have vastly improved in frequency and quality; providing the TFL cycle map in and around the ICL campuses will provide necessary information for any potential cyclists, especially if the individual resides a reasonable distance from the university campus. Inevitably, the closer an individual resides to the workplace, the more likely it is they would walk or cycle. Likewise, people residing in the inner city have access to a greater network of cycle lanes and pedestrian walkways when compared to peripheral areas.

4. Inactive transport alternatives

Low numbers of the student population drive to College campuses and, if they do, the majority lift-share with at least one other person. On the other hand, staff who commute using a private vehicle rarely lift share; however, there is no data available to understand which job roles such individuals occupy.

Case studies

Case Study 1 - University of Florida

The University of Florida case study provides a successful framework for measuring the transportation demands of university students and staff members (Bond and Steiner, 2006). It then capitalizes on this information to create policies such as parking restriction, transit service enhancements (including additional and relocated bus stops), and unlimited access transit to ensure adoption of lower-emission transportation practices (Bond and Steiner, 2006).

Case Study 2 - Eastern Mediterranean University

The Eastern Mediterranean University (EMU) case study serves as an example of (1) how to collect qualitative and quantitative university-level transportation data and (2) developing a guideline to improve transportation total emissions (Dehghan Manabadi, 2012).

Case Study 3 – 'Do it yourself' scheme at the Oldenburg University

Some universities, including Oxford and Oldenburg University runs a 'Do-It-Yourself' bicycle repair shop enabling visitors and students/staff members to rent bicycles at a rate of €6 per week or €20 per month (Oldenburg University, 2020). Though, as in the ICL Travel Survey, it was noted that an incentive to increase the availability of bikes was not of high importance. It may be of low value to existing staff and students at ICL (Oldenburg University, 2020). However, a student organised ICL repair shop could be of use for those in need of bike repairs or mechanical support (Oldenburg University,2020).

Case Study 4 - External Business Example

Transport for London has developed a sustainable business travel strategy, which includes target setting, obtaining business buy-in and ongoing monitoring techniques (Macbeth, 2016).

Case study 5 - Mobile bike repair at and Oxford University

The university of Oxford has a mobile repair scheme for staff members and students. This is available once a week with no pre-appointment required and run on a first-come first-served basis. The labour is for free, covered by the university and the parts are paid at cost.

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CHAPTER 7: BUILDING CAPACITY

Executive summary

A key role of universities is to shape the next generation and to prepare them for the world so that they can be competitive and successful in their field of expertise. As part of this commitment, universities need to prepare students to confront the needs and challenges of society, and in our current times, this unequivocally involves *sustainability*. Here we present some additional actions to make sure this is reflected in the educational system.

What is Imperial doing?

ICL is a world-class university. Every year thousands of students come through its doors to meet the world and its challenges. Its education system has been classified as "excellent" and has seen some of its students become brilliant minds and successful people in the world of business, science, and technology. Students are taught by experts and leaders in their field; they are exposed to high level competition and high-quality work is expected of them. Assignments are common assessment tool to test the students' skills and knowledge. Opportunities to apply their knowledge in real-world settings are offered through internship and placement programmes. Finally, undergraduate and masters' thesis represent a mandatory requirement to obtain the certificate.

The College has done a good job reflecting the needs of the society in their educational programme, adapting to the new times. We have seen the incorporation of new courses and Master programmes on topics like climate change or artificial intelligence. The presence of sustainability-related courses and programmes has also been increasing over the years. Below, we list some initiatives that have either not been implemented yet at Imperial, and so we suggest the College to consider, or that have already been put in place and whose importance the authors would like to stress.

We base a lot of our recommendations on the findings from the NUS nation-wide student survey conducted in 2017/18 (NUS survey 2018). According to this survey, an overwhelming 83% of the students surveyed believed that sustainable development should be incorporated and promoted at universities educational programme and 75% went further to say that this should be part of all courses taught at universities. Internships and placements were also suggested as a good method to include sustainability in the curricula at universities by around 81% of the students surveyed. About 70% and 72% of students believed that adding on to the course's content and linking coursework and dissertations to sustainability would also be effective methods, respectively. Around 69% and 67% believed that this should be provided by extra-curricular courses or activities within the student unions, respectively. In light of these findings, we propose a number of actions that could be taken or further developed by the College.

Challenges and opportunities

1. Basic course to all programmes

Sustainable development has become a reality and a need for our society. This can already be observed in the professional market with the number of job positions on sustainability-related areas raising every day. Therefore, it is important that this is reflected and for **sustainability to be included in the curricula of the undergraduate and master courses** taught at Imperial.

2. Sustainability certificate

In addition to making sustainability an integral part of the curricula, we recommend offering a **comprehensive and fundamental certificate on sustainability.** This would offer an overview on general concepts for sustainable development including economy, technological innovations, as well as ecological and sociological aspects. Ideally, it could also include the **possibility to undertake a short internship or placement during the summer or Easter break**. This could be offered to all students and staff members across the College and offer an official accreditation/certificate of completion.

3. Internships and placements

We suggest increasing the number of **internships and placements offers with companies and charities with a well-defined sustainability agenda**. It is important that a reference institution such as ICL supports those entities and organizations with a good code of conduct and with a commitment to act towards the sustainability agenda. Moreover, when the internships and placements are selected based on a list of projects, there should be **competitive and ambitious projects with application to sustainable practises.** This would give first-hand experience on how the acquired knowledge and skill can be applied to sustainability and give visibility to a job market that for some programmes/courses may not be so obvious.

4. Assignments and thesis on sustainability

We suggest continuing promoting and increase the occurrence of the following:

- **Competitive sustainable projects for undergraduate and master's thesis projects**. These should be easily accessible and represent competitive options for students.
- **Add assignments that contribute towards the sustainability agenda.** This will give visibility to how their knowledge can be applied to help meet different sustainability targets.
- **PhD projects in the sustainability field** (see Case Study 1)

5. Reward or support schemes

The College should be supporting sustainable initiatives that show innovation and potential for impact. There is a clear interest from the community of students and staff members to improve sustainability practises across the College, as can be seen by the number of societies and community-led projects fostering such actions. Therefore, the College should **set up adequate platforms to provide financial and personnel support** to those initiatives (see **Case study 2**).

Moreover, initiatives and community-led achievements should be publicly recognized, and the College should appreciate their contribution. These initiatives often (if not always) rely on voluntary work, hours of dedication and endless confrontation to a plethora of challenges. The College should recognize the achievements of these students and staff members. We recommend the **creation of Sustainability Awards scheme.** This could be run firstly within faculties and then across the whole College. Among the prices, there could be the possibility to scale up the proposed initiative, when possible.

Case studies

Case Study 1: PhD projects on sustainability – Greening Imperial[12]

The Greening Imperial society partners up with the Grantham institute to offer sustainability -related projects as part of the 'Science and solutions for a changing planet DTP' programme. These resulted in several students undertaking projects that will contribute significantly in our knowledge and understanding of sustainable systems, in this case in relation to aviation and sustainable diets.

[12] https://www.imperial.ac.uk/grantham/education/science-and-solutions-for-a-changing-planet-dtp/programme/challenge-teams/project-list-2018-19/greening-imperial/

Case Study 2: Blueprint' at the University of Leeds[13]

Blueprints was set up by the University of Leeds to promote sustainability across the university by providing support to the College community to address sustainability issues that are in line with the university's strategy and sustainability goals. This is open to both students and staff members. They have a devoted team to assess the projects presented and provide the require support for the project delivery. This represents one of the building pillars to the University of Leeds roadmap to sustainable change once the project is delivered and complete, and assessment of the impact and effectiveness is undertaken. Recognition of the achievement for all the team members is given during the Sustainability Award ceremony.

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