

# Education for Sustainability. Green Paper.

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## Introduction to the Green Paper

We believe that students graduating from any of our programmes must understand the pressing societal challenges we face and be prepared to tackle them in creative ways. The purpose of this Green Paper is to start a discussion about the provision of sustainability education widely across Imperial. Below we outline the dimensions of education that we believe are necessary to ensure that every student at Imperial is given the opportunity to learn about sustainability challenges framed broadly as the Sustainable Development Goals, and to develop the practical problem-solving skills required tackle these using their STEMB disciplines.

We encourage critical feedback and suggestions for improvement. These can be emailed to [m.tennant@imperial.ac.uk](mailto:m.tennant@imperial.ac.uk).

The paper has been developed by the Education for Sustainability Task and Finish group.

## Rationale and Aims

This document sets out the rationale for and remit of the Education for Sustainability initiative at Imperial.

The aim of the initiative is to develop world-leading competences in sustainability education. Through this we will ensure that students and staff have opportunities to use the knowledge and skills from their STEMB education to create meaningful, positive impact in the world through a focus on sustainability. The remit covers the development and dissemination of evidenced-based materials and pedagogies, supporting and strengthening existing initiatives, creating communities of practice, and increasing Imperial's external reputation through rankings and educational research.

Sustainability, as used throughout this document, is described as those themes encompassed by the seventeen [Sustainable Development Goals](#) (SDGs). These themes and associated activities aim to bring about positive environmental, social and economic change in the world, improving conditions for people and of the planet. The breadth of the SDGs allows for learning opportunities to be developed for the greatest number of students by and with the largest number of staff, and take advantage of diverse passions and interests.

Success in this endeavour is dependent on the impact that students and staff have through their science. Tackling the SDGs in a meaningful way means that a student's education and practical applications of their work must have the potential to make a measurable and attributable difference both in the world and to them. These are projects that require deep STEM expertise coupled with the passion to make meaningful change in the world<sup>1</sup>.

## What we will do

The remit of our work under Education for Sustainability (E4S) can be categorised under four headings:

1. **Audit:** mapping and evaluation of existing formal and informal learning and teaching initiatives across Imperial.
2. **Enhance:** Development and coordination of existing and new initiatives related to E4S.
3. **Advocate:** Raising awareness of and promoting E4S initiatives and events.
4. **Cultivate:** Leading impact evaluation, including providing guidance on sustainability initiatives' impact.

### Audit

**Audit Current Sustainability Teaching:** Identify and map which of the UN Sustainable Development Goals are taught across all programme and modules.

**Identify Discipline-Specific SDGs:** Identify the SDGs that are most relevant to disciplines. Use these to identify gaps arising from the audit process.

**Identify Existing Initiatives that Support the SDGs:** Identify existing initiatives across Imperial that are underpinned by or contribute to the SDGs, such as the [Transition to Zero Pollution](#) initiative (TZP), the ICBS [Leonardo Centre](#) and the [Science and Solutions for a Changing Planet](#) DTP.

**Identify Student-Led SDG Initiatives:** Identify extra-curricular student initiatives and societies that focus on the SDGs.

**Understand Market Demands for Sustainability Skills:** Identifying and assessing market needs for sustainability skills to ensure education aligns with industry, governmental and societal demands. Identifying which sustainability skills will be needed.

**Source or Develop Teaching Resources:** Identify or create appropriate sustainability teaching and learning resources.

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<sup>1</sup> This description is broadly coherent with the definition of transdisciplinary "Convergence Science", as described by the National Science Foundation (2014).

## Enhance

**Advance Sustainability Education Initiatives:** Develop, coordinate, integrate, and promote sustainability education initiatives and appropriate evidence-based frameworks for learning and teaching.

**Support and Expand Extra-Curricular Engagement:** Support existing extra-curricular initiatives while actively encouraging and promoting the creation of new ones.

**Provide Guidance and Training for Sustainable Education:** Advise, train and upskill staff through programmes, events, and teaching material aimed at enhancing sustainability education competencies, including curriculum design and pedagogies.

**Facilitate Adaptation for Sustainability:** Support staff in making necessary changes to adapt existing educational activities to align with sustainability objectives more closely.

## Advocate

**Promote Awareness of Sustainability Education:** Actively promote and raise awareness of sustainability education within our existing programs and initiatives.

**Highlight Exemplary Sustainability Education Practices:** Showcase existing good practices in sustainability education across Imperial, including from taught and extra-curricular programs.

**Create and Sustain a Community of Practice in Sustainability Education:** Bring together a pool of expertise in sustainability education while maintaining a network of interested staff and students.

## Cultivate

**Curate and Drive Initiatives for External Impact Recognition:** Commission, lead and evaluate activities that contribute to external impact rankings.

**Foster Internal and External Events:** Develop and support events for both internal and external audiences. Collaborate with existing sustainability initiatives.

**Guide the Assessment of Sustainability Initiative Impacts:** Provide expertise and guidance for designing and evaluating impacts of sustainability initiatives and education.

**Develop an Academic Presence.** Work with colleagues to publish high-quality sustainability education research in peer-reviewed journals and present at recognised conferences.

## How we will do this

We propose that the Education for Sustainability initiative be structured as a complementary set of formal and informal entities. The coordinating body will be a Network of Excellence for Sustainability Education (*Network for E4S*).

To ensure transdisciplinarity and institutional relevance the Network for E4S will be overseen by a committee drawn from all Faculties and major sustainability research departments and centres at Imperial.

### *The Network for E4S will*

Create a Transdisciplinary Education Special Interest Group that provides a community of practice for staff and student that will support contemporary E4S research and practice.

Convene a network of department champions that act to promote and further E4S at a local level.

Work closely with departments and institutes that focus on sustainability research and education.

Curate and develop library of evidence-based resources for learning and teaching sustainability.

Lead and coordinate the processes necessary for external rankings.

Initiate a living laboratory for E4S at local, national and international scales.

Cultivate relationships with leading external entities.

## Appendix: Ideal Student Outcomes

In this section we describe and detail the ideal student outcomes that arise from the E4S initiative. There represent the characteristics and competencies that we believe are required of a student to meaningfully tackle sustainability challenges.

An Imperial student:

1. is a *science activist*. Through the intentional application of STEMB our students will work to have a positive impact on global societal challenges.
  - a. the idea of activism is applied to the processes, practice and outputs of STEMB education. Science Activism should strive to affect and influence existing methods, practices, and thinking in ways that result in a better situation than the one in which we live today.
  - b. Significant input from the social sciences and humanities is essential to ensure that the problems tackled by STEMB education, and the outputs, are socially relevant and can make a meaningful impact. This expertise can be provided by integrating expertise from the Centre for Languages, Culture and Communication into the Network for E4S.
2. desires to, learns about and has opportunities to actively make a meaningful difference in the world through the application of their science.
  - a. “making a meaningful difference in the world” is recognition that science must be put to the service of creating a better world, and that there are multiple ways of achieving this.
    - i. this implies that students can assess how impactful their projects are.
    - ii. the routes to greater impact include depth (intervening in and disrupting systems at a fundamental level, rather than the more superficial), which in turn implies creativity.
    - iii. To actively work towards ambitious outcomes requires that students make an active choice to work on a relevant project and to see this through to its conclusion.

3. has a deep understanding of their discipline and rigorous research experience to use this knowledge in effective ways.
  - a. Imperial is an elite research university. The idea of “deep understanding” must be our baseline expectation for performance from our students; those with a deeper understanding should be able to tackle problems more rigorously. Whatever we do cannot compromise that standing in the world; not expecting the highest disciplinary standards risks reputational damage to the university.
  - b. “research experience” means that knowledge is applied to real world projects through rigorous research. Real world projects can be designed to tackle the SDGs and incorporate real-world ambiguity.
4. works to integrate sustainability into everything he or she does in pursuit of excellent science.
  - a. a student must understand the complete process of science, including designing experiments with sustainability at the forefront, championing the sustainable use of laboratory equipment and processes, waste minimisation and using appropriate waste streams for recycling, and appreciating the consequences of their work.
5. is curious and a brave problem solver. They should work to find innovative ways to tackle real-world sustainability challenges.
  - a. all students should get the opportunity to solve problems in some sense. Problems that require curious and brave problem solvers are difficult. They require students to search for problems that interest them (curious) and push them out of their comfort zones (brave) by challenging what they know, how they know it, and how they try to tackle the problems.
  - b. this process of innovation requires students to be experimental and explore space to see what does and doesn't work. It places emphasis on process as well as outputs, and on an environment that allows for multiple attempts to explore a problem's space.
6. strives to use their science to create beneficial impact for society and the environment.
  - a. well-designed student projects purposefully intervene in the world. They create measurable, attributable, beneficial, environmental or social change that is significant for those involved and affected.
  - b. these requirements would normally be beyond what a student can achieve individually, but may be achieved in larger groups, especially in collaboration with other students, staff, or external organisations. (More reasonably, students could be expected to achieve positive outcomes rather than impacts, so we're using the term (purposefully) incorrectly here.)
7. is a collaborator by nature. They can work effectively individually and with others to co-create and tackle problems that are beyond the scope of their own abilities, in a transdisciplinary manner.
  - a. learning environments should be inclusive and diverse. This means that the student must have some degree of cultural competence to allow effective inter-cultural communication and collaboration.
  - b. partners may include others from non-traditional backgrounds and outside of the university, including businesses, NGOs and governments. This requires skills and competencies that can be taught and learnt.
  - c. to be transdisciplinary means that students need to transcend and transgress their own disciplinary and value boundaries. They must first acknowledge that the same problems may be perceived differently by others and can thus be tackled in different

ways. A fuller understanding of the world comes from working with others to create value that transcends individual endeavours.

8. works across all scales. Sustainability problems manifest at local, national and international scales and have different characteristics and associated challenges.
  - a. Students should have opportunities to work on problems across all scales, including with Imperial's community, tackling sustainability problems in their own country, and working on problems that transcend national boundaries.