



The implementation of LEAF at public research organisations in the biomedical sciences: a report on organisational dynamics

December 10th, 2021



**Universiteit
Leiden**

The implementation of LEAF at public research organisations in the biomedical sciences: a report on organisational dynamics

Report for the Ministry of Health, Welfare and Sport

Authors

Thomas Franssen & Hannah Johnson

Acknowledgements

This report was written in close collaboration with Estel Collado Camps, Florijn Dekkers, Lucia Giannini and Benoit Nicolet who led LEAF-implementation in their organisations.

Please cite this document as:

Franssen, T. & Johnson, H. (2021) *The implementation of LEAF at public research organisations in the biomedical sciences: a report on organisational dynamics*. Centre for Science and Technology Studies, Leiden University.
DOI:10.5281/zenodo.5771609

Introduction

Sustainability efforts to reduce CO₂ emissions and the environmental impact of activities in all domains of life is at the forefront of governmental policies, public discourse and board rooms of companies and public organisations. In the sciences a similar sense of urgency is felt¹. However, while the life sciences are essential for improving human health and quality of life, scientific research itself has a significant environmental footprint. Aspects of science that require attention to reduce carbon emissions include laboratory operating procedures, material storage, materials use (specifically single-use plastics), chemical and biological waste disposal, IT, conference travelling behavior, product ordering strategies and data reproducibility. Sustainability initiatives in the sciences are emerging, especially around reducing air travel² and campus greening, but there is very little attention to improving the sustainability of laboratory research practices³.

To help scientists and public research institutions, sustainable lab oriented programmes have been developed to guide their efforts to increase the sustainability of research. Predefined actions and criteria suggested within these programmes and assessment frameworks, allow research management and individual scientists to adapt research practices within their work environment in an attempt to conduct research in a more sustainable manner. One such programme, named the ‘Laboratory Efficiency Assessment Framework’ (LEAF)⁴, has been developed in the UK in 2018 by Martin Farley for University College London (UCL). LEAF offers a 3 tiered assessment framework through which research groups can achieve a bronze, silver or gold accreditation. The practical criteria implemented through LEAF help research groups become more sustainable by lowering their overall CO₂ footprint. Moreover, built-in calculators are available for research groups and organisations to assess monetary and CO₂ savings. Prior to the launch of the LEAF online tool in early 2021, LEAF has been piloted from 2018 to 2020 with great success. 235 research groups participated from 23 different research institutes in the UK and Ireland, which led to an average annual saving of 3.700 pounds (~4.300 Euros) per research group, 641.000 pounds (~750.000 Euros) of total reported savings and a total of 648 tons of avoided CO₂ emissions⁵.

In the Netherlands. LEAF has been adopted to trial as a sustainable lab assessment framework by Green Labs Netherlands (Green labs NL). Green Labs NL is a non-governmental organisation that started in early 2021 and has sought to connect green

¹ Ripple, W. J., Wolf, C., Newsome, T. M., Barnard, P. & Moomaw, W. R. (2019) World scientists’ warning of a climate emergency. *Bioscience* <https://doi.org/10.1093/biosci/biz088>

² Klöwer, M., Hopkins, D., Allen, M. & Higham, J. (2020) An analysis of ways to decarbonize conference travel after covid-19. *Nature* 583, 356–359.

³ For an overview of the literature of sustainability initiatives in higher education see: Omazic, A., & Zunk, B. M. (2021). Semi-Systematic Literature Review on Sustainability and Sustainable Development in Higher Education Institutions. *Sustainability*, 13(14), 7683.

⁴ <https://www.ucl.ac.uk/sustainable/staff/leaf>

⁵ Sustainable Science and the Laboratory Efficiency Assessment Framework (LEAF)”, available at https://www.ucl.ac.uk/sustainable/sites/sustainable/files/leaf_pilot_summary_and_review.docx

teams and other green lab initiatives across, predominantly biomedical, public research organisations in the Netherlands. Green Labs NL began preparations for a LEAF pilot in the Netherlands in the summer of 2021. With seed funding from the Ministry of Health, Welfare and Sport, LEAF was launched in September 2021 in 4 public research organisations across the Netherlands. The first phase of the pilot, between September and December 2021, focused on getting LEAF up and running in the four participating organizations. This process was monitored to gain insight into organisational dynamics and formulate best practices for introducing and using the LEAF sustainable lab assessment programme in Dutch public research organisations.

Do we go top-down or bottom-up?

The implementation of sustainability initiatives usually takes either a top-down or a bottom-up approach. A top-down approach to sustainability means that new initiatives are driven by the management of the organisation. The management might, for instance, set particular sustainability targets. A top-down approach has the benefit that new initiatives are usually very visible and supported by the leaders of the organisation. However, such approaches often fail to connect to the daily practices on the shopfloor meaning that they may struggle to be put into practice⁶. Bottom-up approaches on the other hand, emerging from the shopfloor, usually show more student and/or staff support and alignment with daily practices, however the literature suggests support from management is often a major barrier to successfully embed such initiatives in the organisation⁷. Both top-down and bottom-up approaches show particular pitfalls which indicate that to be successful, a sustainability initiative will have to gather support from both the management and the shopfloor. Sustainability initiatives that fail to entice and involve both the management and the organisation's students and staff are bound to fail⁸. It is therefore crucial for organisations embarking on a sustainability journey, to develop an implementation structure in which sustainability initiatives, both those emerging from management and those that emerge from the shopfloor, are effectively supported and become embedded in the organisation. The support of (permanent) staff is especially important⁹.

Most public research organisations in the Netherlands have only started to develop a formal and organisation-wide approach to sustainability in recent years. Large public research organisations, such as universities and university medical centers, now have

⁶ Brinkhurst, M., Rose, P., Maurice, G., & Ackerman, J. (2011). Achieving campus sustainability: top-down, bottom-up, or neither?. *International Journal of Sustainability in Higher Education*, 338-354: 343

⁷ Ávila, L., Leal Filho, W., Brandli, L., Macgregor, C., Molthan-Hill, P., Özuyar, P. & Moreira, R. (2017). Barriers to innovation and sustainability at universities around the world. *Journal of cleaner production*, 164, 1268-1278: 1270

⁸ Amaral, A., Rodrigues, E., Gaspar, A. R. & Gomes, Á. (2020). A review of empirical data of sustainability initiatives in university campus operations. *Journal of Cleaner Production*, 250, 119558: 3.

⁹ Brinkhurst, M., Rose, P., Maurice, G., & Ackerman, J. (2011). Achieving campus sustainability: top-down, bottom-up, or neither?. *International Journal of Sustainability in Higher Education*, 338-354: 344

dedicated sustainability managers and often an official sustainability strategy. This is not yet the case in smaller public research organisations where sustainability is often part of the overall strategy document and the task to organise the sustainability effort is not formally associated with one particular person. As such the extent to which a crystalized organisational structure and strategy for sustainability is present differs.

Among larger public research organisations a dedicated sustainability manager is often accompanied by a so-called 'green office'¹⁰. Green offices are student-driven organisations, in which the sustainability manager or green office coordinator is supported by a small number of students that are employed part-time or do an internship in the green office. Green offices often take initiatives that are focused on increasing awareness around sustainability issues among students and staff as well as various campus-focused initiatives. Another approach, which can be complementary to the green office, is the establishment of 'green teams'. Green teams are staff-led volunteer groups that usually focus on sustainability initiatives closely linked to their work environment. Within corporate environments a similar role is taken by so-called sustainability champions. In the Netherlands green teams are especially prevalent in the health care sector. The reason health care is at the forefront of this development is the *Green Deal on Sustainable Healthcare*¹¹, the first of which was signed in 2015 and the second in 2018. This has led to a range of initiatives in healthcare including a national network for operating room green teams¹². Remarkable is the success of operating room green teams which also have a national network similar to Green Labs NL¹³. Consequently, as in the Netherlands healthcare and biomedical research are closely integrated, especially in University Medical Centers, we have witnessed a rise of green teams in biomedical public research organisations inspired by their counterparts in hospitals.

The sustainability manager, green office and green team all take a different position in the organisational configuration that is put into place to advance sustainability. Sustainability managers, generally in permanent positions and often being the lead author of sustainability reports, lean towards the management side of the organisation and in general aim to enact the sustainability strategy as set out by the management of the institute. Green offices and green teams are usually made up of interns or employees on a temporary contract that have a less stable relation with the organisation (bachelor or master students, PhD-candidates and postdocs) and other roles as their primary job focus. As their relation to the organisation is more feeble they tend to lean towards staff or student-driven initiatives and adopt a more bottom-up approach. However, while sustainability managers, green offices and green teams tend to side more with

¹⁰ Leal Filho, W., Will, M., Salvia, A. L., Adomssent, M., Grahl, A. & Spira, F. (2019). The role of green and sustainability offices in fostering sustainability efforts at higher education institutions. *Journal of Cleaner Production*, 232, 1394-1401.

¹¹ <https://www.government.nl/topics/sustainable-healthcare/more-sustainability-in-the-care-sector>

¹² <https://milieuplatformzorg.nl/acties-activiteiten/groene-zorg-alliantie/>

¹³ <https://degroeneok.nl/>

management or students/staff, they all play a mediating role and for a successful sustainability strategy it is key that sustainability initiatives are supported by these different entities. Support from the sustainability manager will mean it will be easier to get the management of the organisation on board. Similarly, support from the green office and/or green team can be crucial to involve students and staff.

The implementation of LEAF takes place, and has to be understood, within the specific configuration of organisational actors that together manage sustainability in each public research organisation. Yet, this configuration is slightly different in each of the participating institutions and also differs in comparison to such organisational configurations in the United Kingdom (UK) where LEAF was developed and first piloted. It is therefore informative to first discuss the UK-experience with LEAF before we turn to the Dutch case.

LEAF-implementation: the UK-perspective

As of November 2021 there are 51 UK institutions signed up to LEAF. Taking a birds-eye view across these organisations the director of LEAF, Martin Farley, suggests LEAF implementation is most often coordinated by the sustainability manager of the institution, while on occasion technicians or research staff take the lead. In a number of institutions, notably Bristol University, Exeter University, Oxford University and Imperial College London, LEAF has been implemented in a large number of research groups covering a high percentage of the institution. Bristol even claims to be the first institution to have LEAF-accreditation for all its laboratories becoming the first university in the world to gain 'institutional green lab certification'¹⁴. Imperial College London has included LEAF in their sustainability strategy signaling strong institutional support¹⁵. That sustainability managers take the lead at UK institutions is telling about the difference in the organisation of sustainability between the UK and the Netherlands. UK universities more often have a sustainability department in place with multiple employees (up to 20) dedicated to advance sustainability (e.g. See sustainability offices at [Edinburgh University](#), [Bristol University](#), [University of Exeter](#) and [Oxford University](#)). In comparison Dutch universities often have just a single dedicated sustainability manager working with a small team of students, or, as highlighted in smaller research organisations, no dedicated personnel at all. It is therefore not surprising that the LEAF initiative in the Netherlands is spearheaded by an NGO, Green Labs NL, and is led by local green teams rather than sustainability managers.

¹⁴<http://www.bristol.ac.uk/green/get-involved/green-labs/lab-accreditation/>

¹⁵https://www.imperial.ac.uk/media/imperial-college/about/sustainability/public/Imperial_Sustainability_Strategy_2021-26.pdf

LEAF-implementation: the Dutch case

The LEAF pilot in the Netherlands was instigated by Green Labs NL in collaboration with green teams in four public research organisations that were open to coordinate the pilot. The four public research organisations are two large University Medical Centers, Erasmus MC and Radboud UMC, and two smaller public research organisations, the Princess Máxima Center for pediatric oncology (The Máxima) and Sanquin Research. The implementation of LEAF was led by one coordinator and four Green Labs NL members embedded in the local green teams acted as lead administrators in their institutes. As such, the LEAF pilot in the Netherlands started out as a staff-led sustainability initiative. Indeed, the first task for the involved green teams was to gather institutional support from the management to start the pilot. Subsequently, the pilot was advertised in each of the institutes to research staff and an introduction was offered through a workshop style user-meeting, given by the LEAF admin team, after which research group representatives could sign their research group up to the LEAF-tool online.

This mid-term report is based on a variety of data sources including participant observation during Green Labs NL meetings where the LEAF pilot was discussed, interviews with the coordinator of the pilot, three local lead administrators, the director of LEAF, two sustainability managers of participating institutes, and documentation describing the sustainability strategy of institutes where such documentation was available.

Below we describe for each organisation the configuration of organisational actors that are involved in advancing sustainably, whether a sustainability strategy is present, how institutional support for LEAF-implementation was established and to what extent the green team was mobilized. We further describe the uptake of LEAF in each institute in terms of research groups signed up. Note however, that only at the The Máxima LEAF was available for all non-clinical research groups in the institute due to its small size and integrated laboratory structure. At the other institutions we have sought to limit the pilot to prevent the local green team being overburdened during this introduction phase.

Erasmus MC

The sustainability initiative at Erasmus MC is led by a sustainability taskforce that was set up by the board of directors in 2019. The taskforce includes employees from a variety of organisational subunits that contribute to the group next to their regular job. In addition, the project leader of the taskforce is employed specifically for this purpose. During the first two years the taskforce has made an inventory of all sustainability-related activities already taking place, including aspects such as waste collection and energy use. A first hospital-wide carbon emissions measurement was made in 2020 (for 2019). This will function as a baseline calculation for the reduction target of at least -49% by 2030.

The taskforce has developed a sustainability strategy, written in a collaboration with facilities management, that seeks to combine top-down and bottom-up activity. In the sustainability report 2020, the taskforce explains that they seek to work together with all staff and students: "this bottom-up approach serves as the basis for achieving the goals, where the direction is top-down". To coordinate bottom-up activities the taskforce stimulates the set-up of green teams. The 'green team' model was known to the taskforce to be used in other organisations, especially the health care sector. As mentioned previously, the adoption of the *Green Deal on Sustainable Healthcare* in 2015 and 2018 has led to a plethora of sustainability initiatives in healthcare organisations. As a consequence, the first green teams that were established at Erasmus MC were not located in research but rather on the healthcare-side of the organisation, specifically in the operating room and the intensive care unit.

The Green Team Biomedical Research was launched in the spring of 2021 and consists of 15 active members, two of whom are affiliated with Green Labs NL. Most members of the green team are PhD-students from different departments of the Erasmus MC, combining both laboratory as well as clinical research departments. The Erasmus MC lead administrator for the LEAF pilot was supported by 7 internal green team members who acted as sub-administrators, divided across the participating departments. The LEAF service agreement was signed by the head of the sustainability taskforce after consultation between him and the lead administrator. Currently, 10 research groups across 9 departments are signed up on LEAF. Figure 1 gives a visual representation of the status of the implementation of LEAF in relation to the organisation of sustainability within Erasmus MC.

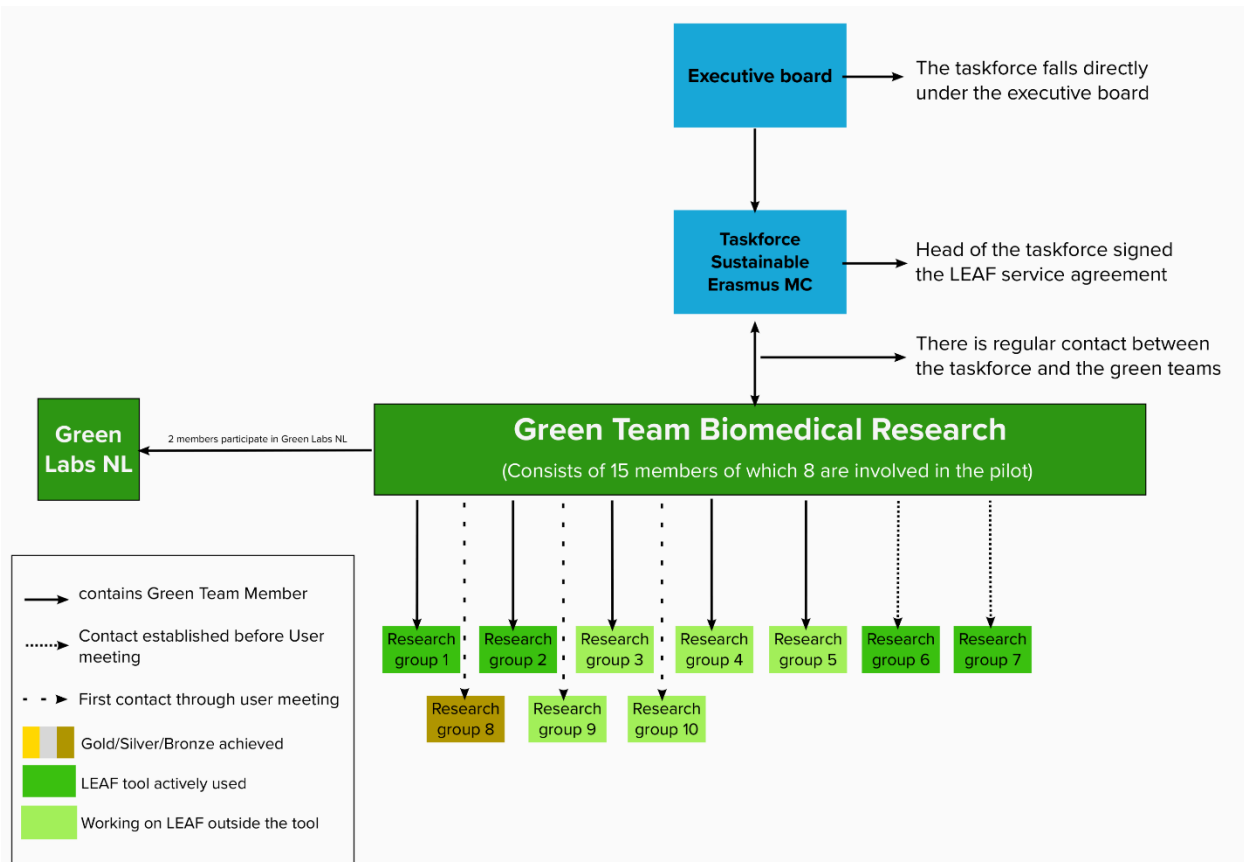


Figure 1: LEAF at Erasmus MC

LEAF implementation at Erasmus MC shows three key-factors for success: (1) the green team is relatively large with 8 members involved in LEAF, (2) there is top-down support for the green team, as well as specifically for the LEAF-pilot, from the sustainability taskforce, and (3) members of the green team are embedded in departments and research groups allowing them to gather bottom-up support and keep momentum going. As the visualization shows, not all participating research groups have green team members in them, as this is not a prerequisite for participation. The green teams that have a green team member in them seem to take a more ambitious approach. For instance, two research groups (3 and 4) that have not yet filled out the criteria because they are trying to unite two whole floors of laboratory spaces and research groups under one submission in the online LEAF-tool.

Radboud UMC

The Radboud UMC has an extensive sustainability strategy developed in collaboration with Radboud University¹⁶. Its current sustainability policy (2021-2024) is the third iteration. Similar to the strategy at Erasmus MC there is ample attention for sustainability in healthcare in reference to the *Green Deal on Sustainable Healthcare*. However, the sustainability strategy also discusses sustainable research and explicitly mentions reduction of CO2 emissions within research activities as a goal, which fits well with the aims of LEAF. The sustainability strategy also discusses the approach taken in both organisations. For the Radboud UMC the aim is to embed sustainability in all layers of the organisation rather than set up a dedicated, but separate, sustainability department. Within Radboud UMC the sustainability strategy is coordinated by the sustainability manager, within the facilities department there is dedicated personnel for energy and waste. Moreover sustainability is also part of the tasks of occupational health, safety and environment officers that are part of human resources and work embedded in each department.

A number of additional organisational entities are designed to help the implementation of the sustainability strategy as well as allow for bottom-up activities to emerge. On the management-level this includes, amongst others, a sustainability board that has been set up to guard the sustainability strategy. The members of the sustainability board also act as ambassadors in the organisation. On the staff-level in the organisation there is a cross-departmental network for all staff interested in sustainability. Part of that network are staff-led green teams in which the more active staff organises bottom-up activities. Currently there are 9 green teams, in various levels of maturity. On the research-side of the organisation this includes a green team in cell biology and a wider scoped green labs team that coordinates the LEAF-pilot. Lastly, to involve the student body of both Radboud UMC and Radboud University a green office has been established that is led by a coordinator and a number of part-time employed students.

Radboud UMC has by far the most extensive organisational configuration for the implementation of its sustainability strategy of the four participating organisations. Within this configuration, green teams are meant to allow for bottom-up initiatives. According to the sustainability manager, the level of bottom-up initiatives has risen strongly over the past couple of years, indicating a much larger personal commitment among staff. The Green Labs Green Team at Radboud UMC is an example of such a relatively young initiative. This green team was established late 2020 and is relatively small, compared to the other green teams seen in other organisations in the LEAF pilot, with 6-7 active members. The green team is vulnerable due to the small-size and this also affected the implementation of LEAF. Because resources were limited, 1 member of the green team was responsible for LEAF implementation, the pilot was kept small initially and three

¹⁶<https://www.radboudumc.nl/getmedia/3f893b4d-002e-4d57-8d67-cc58b781d960/EN-DEF-Duurzaamheidsbeleid-2021-2025.aspx>

research groups were invited to participate. Through word of mouth a fourth research group became interested and currently, four groups are signed up to LEAF. Figure 2 gives a visual representation of the status of the implementation of LEAF in relation to the organisation of sustainability within Radboud UMC.

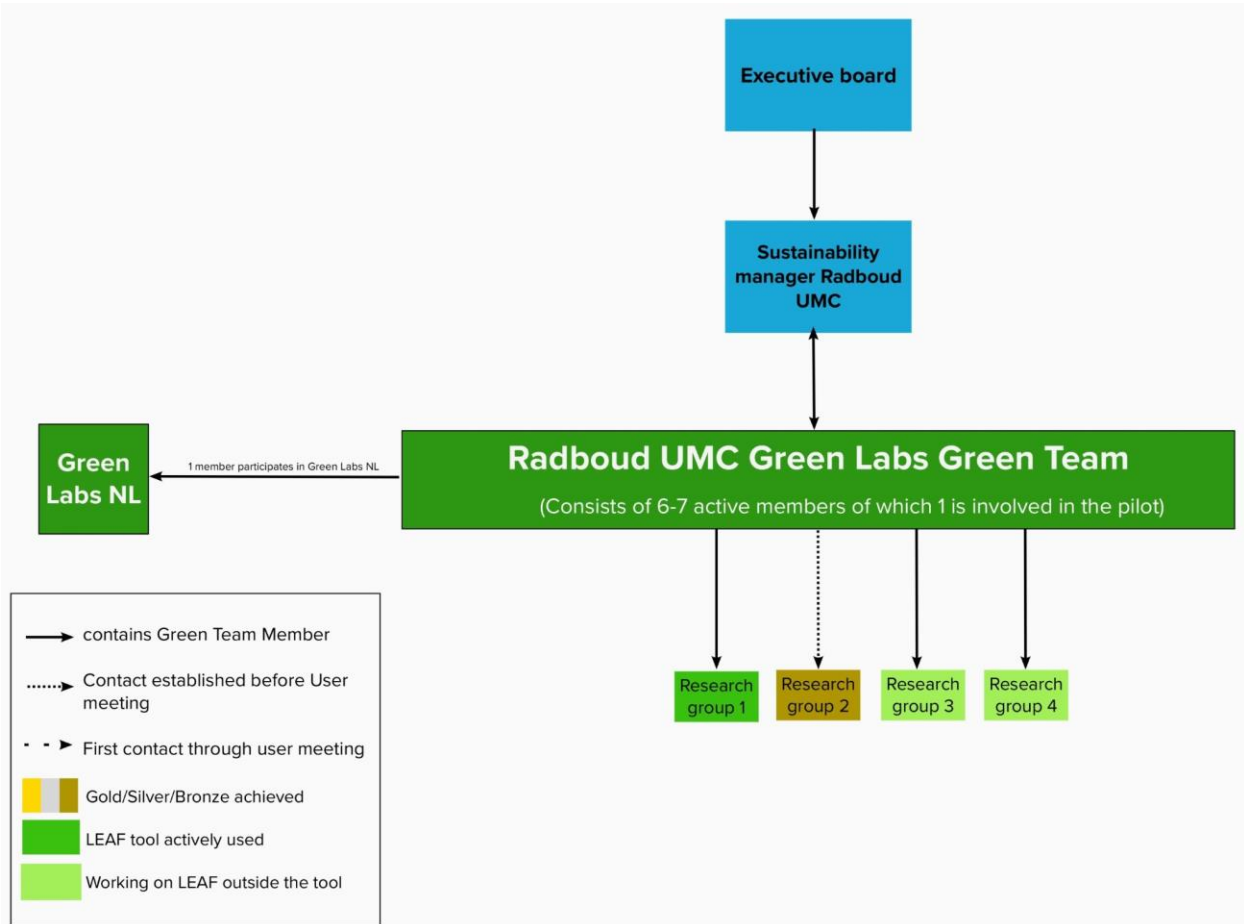


Figure 2: Radboud UMC

Despite the extensive organisational configuration for sustainability initiatives at Radboud UMC a modest approach was taken with inviting only a few research groups to the LEAF-pilot. A key factor here is the lack of resources within the green team driving the pilot. Without additional administrators it would be unwise to add many research groups to the pilot. In the case where the green team can be strengthened with new members, the pilot could be extended to more groups in 2022. A second factor is the already extensive sustainability strategy of the Radboud UMC as well as an impending relocation and reorganisation of laboratories to a new building. Because there is already an extensive sustainability strategy in place it is important to integrate the LEAF-tool within that strategy to secure its continuity over time. The move to the new building might be the right moment to offer LEAF to all research groups at the Radboud UMC, as the sustainability driven

work practices can be integrated as part of the new facility daily runnings. Because of the smaller size of the green team, the question who should coordinate LEAF-accreditation for the whole organisation in case LEAF is adopted would be an open question.

Princess Máxima Center for pediatric Oncology

The Máxima is a very young (established in 2014 and built for opening in 2018) and comparatively small public research organisation. The Máxima does not have a dedicated sustainability manager but does mention a number of areas in which it aims to improve its sustainability in its strategy document 2020-2024, such as energy use, waste disposal and sustainable procurement¹⁷. Moreover, the building has been designed with sustainability in mind¹⁸. To achieve sustainability aims The Máxima seeks to collaborate with the nearby, far larger, Utrecht University Medical Center. The Máxima green team was established in mid 2021 by 2 of the founding members of Green Labs NL. The two initiators first sought support from the principal investigator they work for and, upon approval, support from the board of directors and research management jointly. The green team was officially approved in a meeting between the instigators, a member of the board of directors, a member of research management and the head of facilities. After that actions were taken via email to bring a group of enthusiasts together in a first Maxima Green Labs introduction meeting. Introducing LEAF to the research department was already a primary aim in the establishment of the green team prior to the initiation of the Green Labs NL pilot project.

The lack of a sustainability manager and sustainability strategy means that there is little top-down activity around sustainability other than in the context of the *Green Deal on Sustainable Healthcare*, which the Maxima is about to sign. However, as the organisation is small, coordination of sustainability initiatives seems relatively straightforward. The green team is in contact with research and facilities management and one of the members of the board of directors, who is committed to sustainability, offers additional support. The green team has grown to include 10 active members of which 8 are also active in the LEAF-pilot. In The Máxima there are between 20-25 non-clinical research groups that were approached in the LEAF pilot. Currently, 6 research groups have signed-up to LEAF all of which include green team members. The participating laboratories use the monthly green team meetings to discuss progress, exchange experiences and strategize for joint efforts towards criteria fulfillment in shared lab spaces. Figure 3 gives a visual representation of the status of the implementation of LEAF in relation to the organisation of sustainability within the Máxima.

¹⁷<https://www.prinsesmaximacentrum.nl/download/nl/3>

¹⁸<https://www.rivm.nl/green-deal-duurzame-zorg/gezondheid-bevorderen-door-goede-leefomgeving-zorginstellingen/architectuur/kinderoncologisch-centrum>

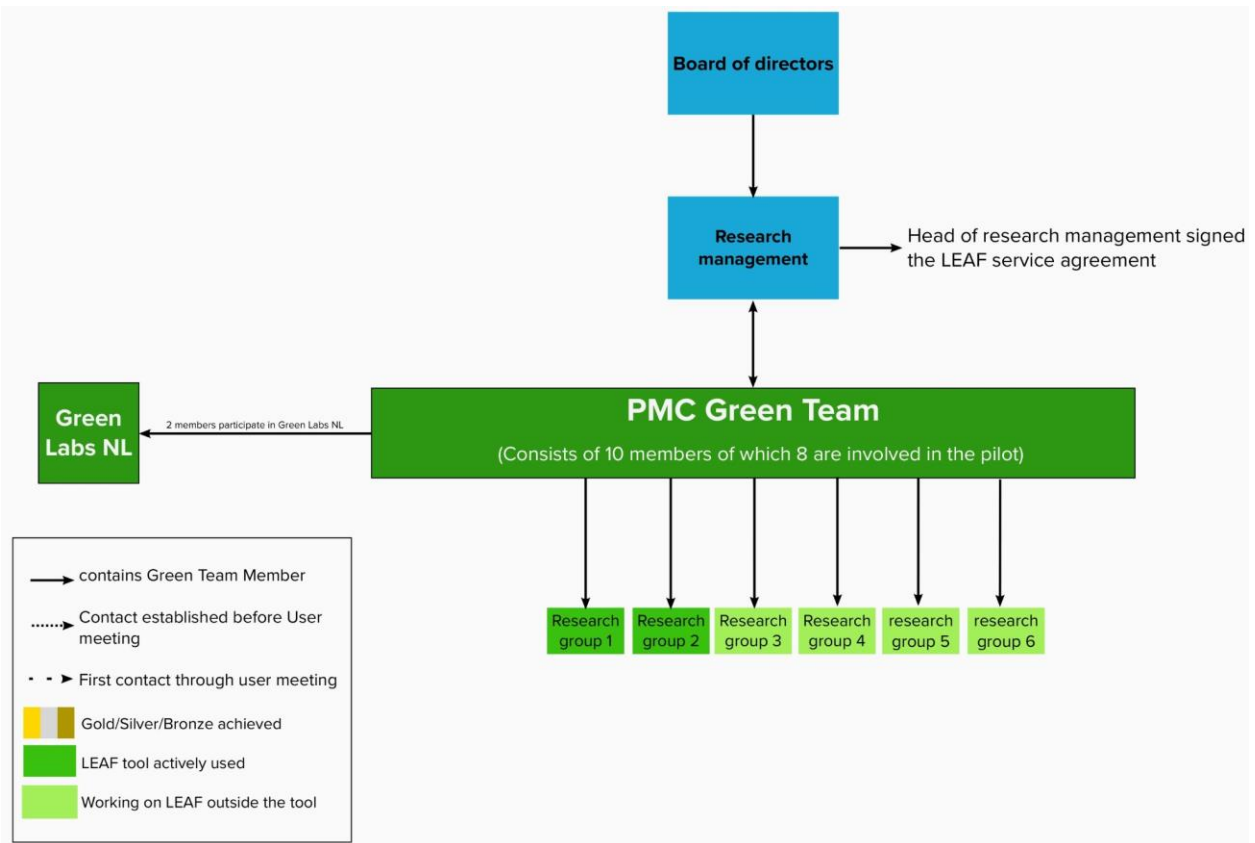


Figure 3: Princess Máxima Center for pediatric oncology

Despite the lack of a dedicated sustainability manager there was little trouble for the green team to get institutional support from management. Moreover, as the green team is sizable, and many members are involved in the pilot, there is ample opportunity to connect to the shopfloor for bottom-up support.

Sanquin Research

Sanquin Research is a small public research organisation in the biomedical sciences. Sanquin Research does not have a dedicated sustainability manager. However, Sanquin has a corporate social responsibility policy that includes a number of sustainability targets¹⁹. These include a reduction of carbon emissions with 50% by 2030, and a reduction of plastics use with 10% by 2022. This policy sits with a cross-departmental team and is traditionally embedded in occupational health, safety and environment which is the responsibility of facilities management. While the team is not dedicated to sustainability there is attention to, and appreciation of, issues such as energy efficiency

¹⁹ https://www.sanquin.org/binaries/content/assets/nl/over-sanquin/mvo_beleid_sanquin.pdf

and sustainable waste management, as the above sustainability targets show. However, there is little to no direct contact between facilities management and researchers.

The Sanquin green team consists of 10-15 active members of which three are involved in the LEAF pilot. However, the green team is not part of implementation of the sustainability targets set out in the corporate social responsibility policy specified above. The green team is in contact with the head of research, who has offered support for the LEAF pilot, but there is no organisational layer between the principal investigators and the head of research which could allow for coordination across research groups. A dedicated sustainability manager that falls under research management, as seen in two other organisations that participate in the pilot, would allow for the development of an organisational structure to take sustainability-related initiatives. Figure 4 gives a visual representation of the status of the implementation of LEAF in relation to the organisation of sustainability within Sanquin Research.

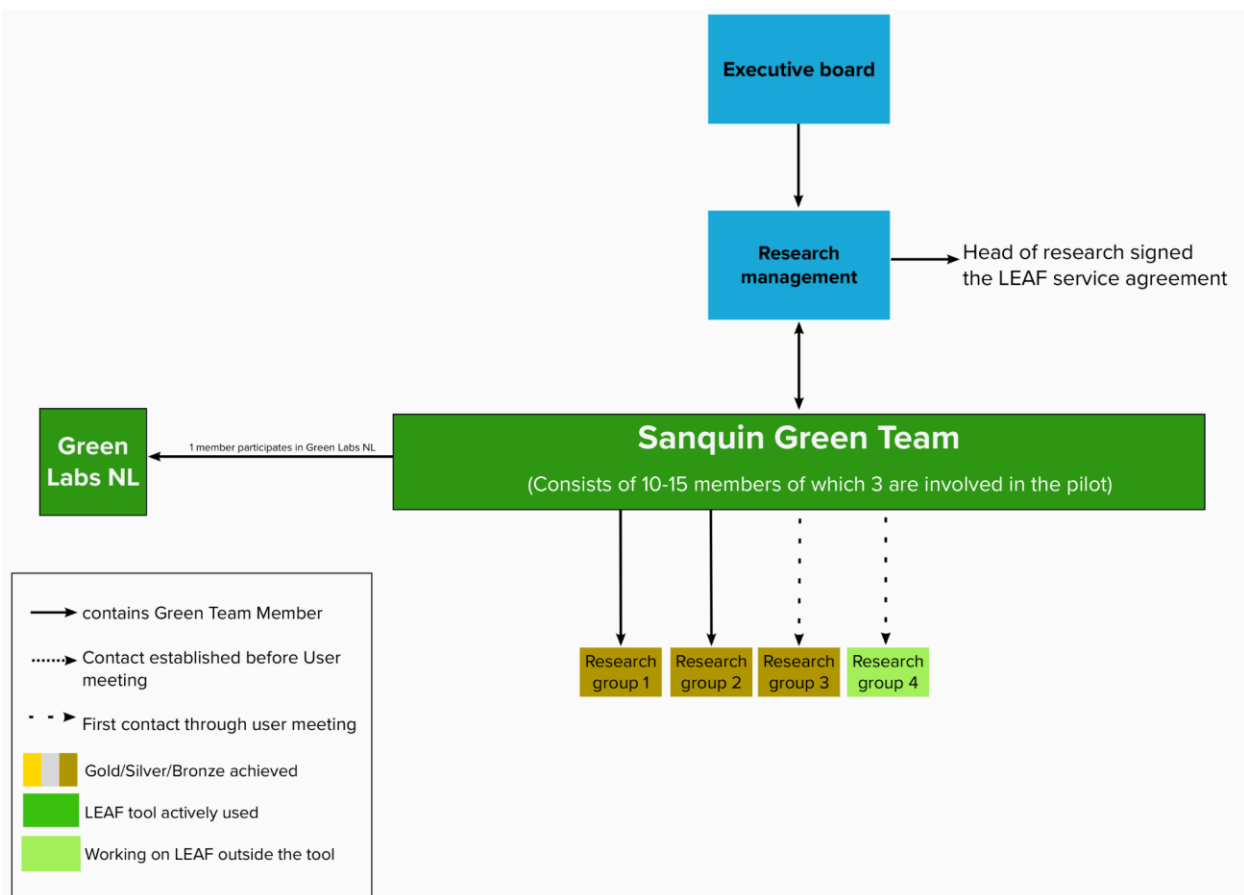


Figure 4: Sanquin Research

Despite the lack of a sustainability manager there was little trouble in getting managerial support for the LEAF pilot. The capacity within the green team for the pilot is limited with three involved members. Currently four research groups are signed up to LEAF, of which

three include a green team member. While there is attention to sustainability in the organisation, the organisational configuration for the implementation of sustainability is still in early stages. The role of the green team is somewhat unclear, and a dedicated sustainability manager that mediates between different pillars in the organisation is felt would be a great addition.

Best practices

In contrast to the approach encountered in the UK where sustainability managers coordinate LEAF, the Dutch pilot has taken a staff-led implementation approach through local green teams. The first phase of the pilot shows that this approach can indeed be successful but also that collaboration with the sustainability manager or research management is important. Green teams in all four public research organisations have proven able to coordinate LEAF-implementation. A total of 24 research groups are now signed up to LEAF and 5 have already achieved bronze accreditation, signaling support for sustainability initiatives within the biomedical research community. In this section we report preliminary observations on sustainability management in the four participating organisations, as witnessed in the context of the LEAF pilot, and we formulate best practices for LEAF-implementation.

What does a green team need?

While we took a staff-led approach, it was immediately clear that support from the sustainability manager and/or a committed research management representative is necessary in the LEAF-implementation process. This is, firstly because the use of the LEAF-tool requires a service agreement to be signed by the organisation. As the service agreement represents a (potential) financial commitment for annual continuation of using LEAF for the organisation, a green team, that usually does not have any budgetary authority, can not sign it itself. However, the LEAF annual fee is modest, and our experience suggests that a sustainability manager is usually in the right position to make this commitment. However, this necessitates coordination between the sustainability manager and the green team from the start. Moreover, commitment of the sustainability manager and/or research management also increases the legitimacy of the LEAF-tool and they might support communication about LEAF through central communication channels.

The green team itself benefits from being well embedded in the organisation and should aim to have a group of active members to tackle LEAF-implementation. Due to the fact there is some required commitment from local coordinators and administrators (generally in voluntary roles in addition to contracted work roles), we suggest to scale initial LEAF-implementation to the size of the green team to prevent these members being overwhelmed, and to guarantee continuity over time. Once LEAF is set up and effective

in the organisation, wider implementation can continue and organisational 'lessons learned' can be applied. With a too small green team, in the absence of support from a sustainability manager, there is a chance it won't be continued as members on temporary contracts depart.

In regards to the enrolling research groups in LEAF, individual green team members play a crucial role. The pilot results shows that green team members being present in departments and research groups eligible to join the pilot, aids wide implementation and swifter actions being taken towards setting up the research group in LEAF and getting started on achieving bronze accreditation. Additionally, prior contact between enthusiastic departments/research groups and the green team as well as the user meeting can aid research groups to sign up and overcome initial hesitations.

Moreover, in certain organisational structures, such as smaller institutes where a lot of lab space, equipment and purchasing policies are shared, green teams can be used to tackle criteria on an institute level, making them easily attainable for individual research groups. The initial results show that research groups develop measures required in LEAF collectively. This indicates LEAF might also increase social cohesion within departments as bonds across research groups are strengthened.

Sustainability management in public research organisations

The analysis of the first phase shows that there are big differences in the extent to which participating organisations have a structure for sustainable management in place. A fully crystallized sustainable management would include a sustainability strategy with sustainability targets and an assessment framework to guide yearly reporting. Moreover, a sustainability manager, with a team, and dedicated entities throughout the organisation (which can include a student green office, green teams, faculty networks, a sustainability board and so on) would support the implementation of the sustainability strategy. Radboud UMC is clearly furthest in developing such a crystallized sustainability management structure, with Erasmus MC developing in this direction as well. The two smaller public research organisations both show a clear interest in sustainability, and their support for the LEAF-pilot is proof of this dedication. Yet, the lack of a dedicated sustainability manager in both organisations might be a barrier for an overarching sustainability strategy to be implemented, or for such a strategy to emerge at all.

However, the pilot shows that LEAF-implementation can successfully happen in organisations with little to no crystallized sustainability structure as long as a green team is present and there is support by research management. We have therefore produced two 'how-to' guides to support enthusiastic individuals in other public research organisations.

The first how-to guide entitled 'How to start a Green team' explains how one can set-up a green team based on the experiences of members of Green Labs NL.

The second how-to guide entitled 'LEAF in your Research Department' provides recommendations and stepwise guidance on how to enrol your research department or whole organisation in LEAF. The guide gives a prior overview in preparation for what would be useful to implement (in regards to green teams) and practicalities about the administrative roles and meetings your organisation will accommodate for.

Both can be found in the appendix to this report.

Next steps: Phase 2

After introducing LEAF and assessing the implementation in the 4 public research organisations in Phase 1, Phase 2 of the Green labs NL pilot looks to continue the roll-out of LEAF in the Dutch science system.

The four participating organisations will continue to promote LEAF in their organisations and will extend the possibility to join LEAF to more research groups. The goal is to widen the participation to all biomedical research departments in each of the four organisations. The local lead administrators aim to encourage use of the LEAF inbuilt calculators, as they are not mandatory for use, to be able to gain some insight into monetary and CO₂ savings of the different research groups and of the organisation as a whole at the end of the annum period. With the hope of successful and enthusiastic use of LEAF by the organisations research groups, the green teams aim to have LEAF participation renewal agreed by sustainability or research management and become a standing core feature of the biomedical departments.

In order to use 'best practices' and the resources produced from Phase 1, Green Labs NL aims to further enable the implementation of LEAF in at least 10 more public research organisations across the Netherlands in 2022. By widening the spectrum of the pilot to further include public research organisations from other scientific domains as well as more biomedical backgrounds, Green Labs NL can assess if the learned strategies ring true in organisations of similar structure to the already participating entities. Additionally, the involvement of more research groups and organisations allows a larger pool for quantitative data gathering in an attempt to replicate findings from the UK 2018-2020 LEAF pilot.

Lastly, we aim to discuss future perspectives for LEAF (or similar sustainable lab oriented programmes) in the Dutch science system. Green Labs NL aims to encourage LEAF to be implemented in all Dutch public research organisations and the accreditation recognised by funding bodies, ultimately as a requirement for funding applications.

Appendix

How to start a Green Team

When promoting sustainable research in your organisation or department, support from the top and bottom are equally important. Depending on your organisation's set-up, there may be some top-down initiatives already in place, such as a sustainability strategy including specific targets for the research departments, a dedicated sustainability manager or a green office implementing sustainable initiatives on your campus. Whether this is the case or not, support for sustainable actions in the labs ultimately falls in the hands of the researchers working there day in, day out.

Green teams, Green groups and **Green initiatives** have been popping up all over the scientific community in recent years as grassroots initiatives to initiate, support and promote sustainable research actions by those in the lab themselves. By acting on sustainability with a bottom-up approach, scientists are enabled to implement their own sustainable ideas and measures while giving confidence to maintain research quality.

Here's some recommendations and tips from Green Labs NL based on our experience of starting Green Teams in our institutes!

Gather your crew

When broaching sustainability in your labs, it's good to come with supporters. Not only will having other sustainable enthusiasts on board from the start help to ease the load, it also adds to the ideas factory about what type of projects would be beneficial for your research department(s) and where to get started.

Talk about your ideas with colleagues and work friends and see if you can pick out those that might like to start this grassroots initiative with you. If you work in a large organisation, gathering people from different research departments may help spread the voice and ultimately have a larger impact.

Brainstorm

When creating a new initiative, it is good to collect ideas on where to get started. This will also be important when seeking a stamp of approval from management. Don't forget to use the multiple resources found on the [Green Labs NL website](#) to gather background information and ideas.

Start by looking at your own research habits and identify actions you could easily take to make your work more sustainable. This could be something like adapting your pipelines to reduce unnecessary single-use plastics, switching to a more sustainable [Green Chemistry](#) approved component, switching to [greener algorithms](#) or setting up a simple [data management](#) strategy to avoid unnecessary data storage use. Bring these ideas together with your sustainable enthusiastic colleagues and together start looking at the wider research department. It's key to identify *low-hanging fruit* so that you start tackling ideas that are obtainable, manageable, and easy to implement. For example, these could be [signage](#) for equipment on/off policies, awareness around shutting the sash, or easier access to recycling bins near/in lab spaces.

The stamp of approval

You can implement small changes within your research group (e.g., group sample/data storage management and [lab exit strategies](#), plastic reduction in experimental pipelines, on/off policies for group-owned equipment), however when wanting to start anything on a wider scale in your research department(s), it's likely that you will need to secure support from management (e.g. PI, department head, sustainability manager). This will for instance aid to communicate the initiative wider through institute newsletters, or support conversations with centralised facilities or purchasing departments if you need their input and support on certain changes you want to implement.

As the efforts you make around promoting sustainability in the labs is likely to be on the side of your full-time role, you may want to ask for support from your PI/lab head or supervisor to work on this next to your research projects.

Identify who in your research department or in your institute would be the main authority, or reference person, regarding setting up an institute/department-wide green team. Likely it will be a sustainability manager, if your organisation has one, or research and/or facilities management. **Aim high!** The higher up the support goes, the easier you will find implementation in the long run and the greater success at continuation of initiatives.

Formulate your ideas gathered during brainstorming into a nice presentation or a document and set up a meeting to present them to whoever you are seeking approval from. Find out what ideas may already be in place or in the pipeline from the management perspective but be sure to stress the importance of a bottom-up approach to go with it. Coming well prepared will help to convince them to get on board!

Rally wider interest

Once management is on board, share your plans for the initiative with anyone and everyone in your research department(s). It is likely that you will find other enthusiastic colleagues that may not be in your direct circle who are willing to form the green team with you.

Utilise your department/institute communication channels to invite everyone to a seminar/presentation around sustainable science. These channels could be department-wide email lists, newsletters, intranet pages or screens in communal spaces around the institute. Look into potentially inviting a speaker for the seminar who has done similar work in another institute or elsewhere in the scientific community. Don't hesitate to contact Green Labs NL for this!

If your institute has multiple research departments/faculties, make sure you open up the invitation to all, as having green team members embedded in areas outside your immediate work environment will help to get actions more easily implemented across different departments/faculties.

Connect with your green team

During your seminar, ensure you have a contact point set up for those that want to form the green team with you. It's likely you will have people merely interested in the topic joining the seminar and people that also want to get elbows deep in starting the initiative like you. Make sure they know how to find you, and that you have plans to form a group dedicated to taking action within your institute and department. Set up another more focussed meeting with those that have reached out to discuss how you can get organised and where you want to get started.

Organise your green team

Utilise internal digital spaces that everyone can access to set up chat groups and resource sharing for your green team. These could be designated email lists and/or ideally platforms such as Teams or Slack.

Use your focussed meeting to find out who your fellow green team members are, what their main interests are regarding sustainable research and, based on this, set up work groups. These could be groups such as [Waste](#), [Energy](#), [Purchasing](#), [IT](#), [Communication](#). By spreading the load, it will become easier to get things achieved and not leave members feeling overwhelmed.

If your green team only consists of a few enthusiastic colleagues, tackle topics together on a monthly or bi-monthly basis. Maybe start with a [Shut the Sash](#) campaign or by looking at improving the waste pipelines in the labs. **Start small and concrete!** Manageable chunks are key when it comes to creating a sustaining initiative. Completing your first project, no matter how small, will help strengthen the team and gain confidence for further sustainable action.

Set up a regular meeting time for your green team to connect, report back on what each group/person has been up to, share feedback on the designated projects and see which further ideas can be expanded. Organising a sustainability related activity can help your green team get to know each other and give space to external brainstorming time.

Also consider introducing a sustainable lab programme, such as [LEAF](#), to your institute/department. Such programmes generally come with defined criteria and resources to help you figure out what actions to take and how.

Check out the Green Labs NL resource "[LEAF in your research department](#)"

Communicate

Don't forget that it's very important to communicate your efforts within your organisation but also publicly. Utilise internal communication's lines to keep colleagues updated on your actions and achievements, gaining visibility, and perhaps even see your green team grow.

Also, share what you are up to with the wider scientific community. You can find lots of ideas and resources from other groups on places such as Twitter, LinkedIn, specific group (web-)pages, and of course at the [Green Labs NL](#) community meetings. Don't forget that the community would love to see your tailored resources and ideas too!

Get Greening up your lab!

Looks like you're ready to go and we wish you all the success!

Happy Sustainable Researching

Green labs NL- info@greenlabs-nl.eu

LEAF in your Research Department

The [LEAF](#) certification programme contains a set of tools and resources which allows research organisations to build a local capacity for sustainable research operations through self-assessment and local auditing. When introducing a sustainable lab orientated programme such as LEAF, you will need support from a range of people. Because LEAF can be introduced institute-wide, we recommend doing this with the guidance of a **green team**, dedicated to sustainable research in your organisation. This is a great way to gain support and share the efforts of rolling out sustainable lab practices within your research departments.

If your research organisation does not have a green team yet, check out the [Green Labs NL](#) resource "*How to start a Green Team*" on our website resources page.

Here you can find some recommendations and suggested stepwise guidance from Green Labs NL using our experience during the LEAF pilot in the Netherlands. Also have a look at our report "**The implementation of LEAF at public research organisations in the biomedical sciences: a report on organisational dynamics**" for further in-depth detail about our pilot findings, which can be found on our website resources page.

Terminology

- Institute (collection of faculties)
- Faculty (collection of departments making up one subdivision of an institute)
- Department (collection of research groups)
- Floor (physical space in a building)
- Lab space (physical space, usually a room or a series of rooms with dedicated equipment and a door)
- Research group (team of researchers usually headed by a principle investigator (PI), also called PI-group or lab-group or lab with a specific "*Name*" in other contexts)
- Green team (group of voluntary members dedicated to sustainability initiatives, and usually made up of representatives from various research groups/departments and employment levels)
- Sustainability manager (dedicated person(s) set in place by management to implement sustainability goals of the organisation)
- LEAF User/Administrator (two distinct levels for users of the LEAF tool)
 - User: a user is associated with a single research group as defined on the LEAF tool and has the task to fill in criteria for his/her own group.
 - Administrator: An administrator has full access rights for your organisation and is in charge of the assessment of LEAF submissions.
- LEAF Submission (submission of all the criteria within an award level (bronze, silver, gold) by research groups participating in LEAF)

Green labs NL- info@greenlabs-nl.eu

LEAF central team - LEAF@ucl.ac.uk

Step 1: Rally some interest

It's good to ensure that you have the support of the research management or sustainability manager, if you have one, at your department and/or institute. This helps to get LEAF accepted as an internally approved sustainable lab programme. With the help of your green team or supporting colleagues, spread the word and gather interested research groups so that you have an idea of who to invite to the *user meeting* and who you should appoint as *administrators*. It is always good to start with a few motivated research groups, rather than trying to involve an entire department in the implementation step.

Communicate to colleagues via internal sources but also just by talking to them about your sustainable initiatives at research meetings or informally.

LEAF requires a service agreement to be signed on behalf of the participating department/organisation. We recommend approaching department heads, sustainability managers or research management to ask them to be the signatory. The service agreement requires an estimated number of participating research groups so tally those that have already shown interest and use it as a way to show your managing parties the preliminary enthusiasm to use the LEAF tool.

Step 2: Gather LEAF administrators

LEAF requires institute administrators to review submitted criteria, approve certification applications, and reconfigure calculators to represent your specific organisation. This could be any staff member who is willing to show some dedication to implementing and upkeeping the use of LEAF within your organisation. Time dedication can vary from a few hours a month to a few hours a year depending on the roll-out scope of LEAF in your research department and the range of supporting colleagues to aid in tasks.

We recommend using your green team to identify suitable administrators. Depending how your institute is set up, you may appoint an administrator per faculty, department, or floor when enough supporting colleagues can be found. Having green team members in each of these (sub-)units may make it easier to get groups to sign up and participate, but it is not a strict requirement. You could also ask a few members from the green team to become administrators for the whole institute and divide tasks in a shared manner. Administrators should familiarise themselves with the contents of LEAF.

Calculators: Calculators are optional for LEAF users but can give valuable information on how much research groups and institutes as a whole are saving in terms of CO₂ emissions and costs. The base figures included in these calculators can be updated so that they reflect your own organisation. Administrators can help to source these numbers through the help of members from the facilities department and national figures. As an administrator, you can pre-fill in the base information to reflect the common energy, water and waste stream costs of your organisation, but also help individual research groups with less common figures. Don't hesitate to contact Green Labs NL when sourcing information relevant to the whole of the Netherlands.

Criteria review: When a research group submits for an award level, administrators will be prompted to review the completed criteria from each group. Criteria submissions are in a free text format and users are expected to write a few sentences to explain how they met/or could not meet the criteria. Supporting evidence can be submitted internally to administrators or an in-person audit can be performed, if required. Administrators can provide feedback to individual criteria. This can facilitate continuous improvement for the research groups, as after achieving an award level they can further improve how they've addressed old criteria in a following year's submission. The aim of this exercise is to reflect on what is possible in terms of sustainability in the context of the research activities that go

on in the research group. Work together with the research group to achieve what you both regard as the best possible outcome.

Local guidance: For each criterion, LEAF offers resources in the form of background information on the topic or poster/sticker templates to use in-house. It also allows institutes to add their own local guidance and resources that may be more relevant to your location. Engage your green team to source and put these resources together or collect recommendations and initiatives coming out of research groups themselves.

Keep an eye on the Green Labs NL website for additional information and send us through any links and resources that we can share with the rest of the Dutch scientific community.

Step 3: Sussing out your research department's structure and participating entities

The definition and size of a research group can vary greatly between organisations. LEAF allows you to map and track your groups through creating an organogram, in which each organisation can define their research group setup and overarching divisions (e.g., departments, faculties, etc).

Ask your green team or LEAF (co-)administrators to map out the structure of your research department(s) and to identify the relevant participating entities. If unsure, contact the [LEAF central team](#) for guidance.

Draft an organogram to display the institute structure, highlighting research groups/departments that have already expressed interest in participating in LEAF. This scheme can be inserted in the digital interface of the LEAF tool as your institute.

LEAF is geared towards the operations of wet/dry lab users, thus focusing mainly on the actions of the research group(s) working in such lab spaces. However, take account of the following:

- Some equipment/physical spaces are shared between research groups. For some sustainability initiatives, coordination across research groups and with lab/facility managers will be necessary.
- Research groups can combine and decide to join as one unit due to being either smaller groups or sharing a large percentage of equipment. For example, a floor consisting of 10 research groups and 4 lab spaces shares a lot of equipment and has overlapping research activities, and may therefore register as fewer groups on LEAF, aggregating groups that work closely together. Or 4 research groups consisting of a small number of group members and sharing all equipment may combine their efforts and similarly join as one group. Combinations of multiple research groups can choose a group name reflecting their shared topic/interest, e.g., Ear institute.

Step 4: Administrator meeting

Once you are ready to get started with LEAF at your research department, organise an administrator meeting with the LEAF central team. Within the meeting you will set up your institute on the LEAF digital interface, ideally using the organogram already prepared.

Local LEAF administrators will be given a tour and practical explanation of the tool and can already sign up and register to gain access. Instruction on how to adjust calculators, review criteria or add local guidance will be given.

Step 5: User meeting

Once everything is in place and administrators are briefed, a user meeting is held for all research groups that are interested and/or have been invited to partake in your organisation's rollout of LEAF. Make sure to invite all those whom you have identified as potential LEAF users, but also open the invite to others in the departments that may be able or interested to partake.

The user meeting will again be headed by the LEAF central team, providing information about the rationale behind LEAF, its contents and manner of use. Typically, a meeting no longer than an hour is required.

We recommend giving a short introduction to lab sustainability at the start of the meeting as some participants may not be as aware of these concepts as you and your fellow sustainable science enthusiast colleagues.

During the meeting, users will be given a tour of the tool by the LEAF central team to understand what it entails for them and their research group, and they will be able to ask questions about its use and their involvement. It is also a good idea to introduce your local LEAF administrators and let users know how they can reach you for further information or questions. Consider following up with interested research groups after the meeting by sending the LEAF user guide to help them get set up on LEAF.

Step 6: Get greening up

Hooray, your research department should now be set up to use LEAF!

Maintain momentum with regular communication via your green team and internal communication sources. Consider organising discussion moments with LEAF administrators and/or users to hear about their experiences and optimise LEAF implementation within your organisation. You may also choose to develop local guides or to facilitate the implementation of certain criteria centrally for the whole institute, when applicable, with your green team or LEAF administrators. Ensure to openly acknowledge when a research group obtains an award certification level and consider small (sustainable) prizes or gifts to be awarded alongside the LEAF certification badge.

Contact your organisation's communication team for public recognition and acknowledgement of the first research groups that achieve an award. And, of course, let us know at [Green Labs NL](https://www.greenlabs.nl) how it's going, so that we can also highlight your efforts through our channels.

Don't hesitate to contact us for further advice and resources.

Happy Sustainable Researching!

