

COVER PAGE

PROJECT INFORMATION

Please complete the fields below with information regarding your project.

Project Title McGill Robotics - Sustainability Transition

Brief Description Promote a culture of sustainability at McGill by 1) building robots and using them for environmental data collection and 2) hosting sustainability oriented tech workshops and hackathons

Total Estimated Project Budget \$61,025.76 **Amount Requested from SPF** \$61,025.76

Campus(es) Impacted Downtown Macdonald Gault Nature Reserve Other _____

CONTACT INFORMATION

Project Leader

This person must be a current McGill University student, administrative staff, or academic staff.

Name	<u>Diana Gomez Galeano</u>	Affiliation	<u>Undergraduate</u>
Email	<u>diana.gomezgaleano@mail.mcgill.ca</u>	Campus	<u>Downtown</u>
Faculty/Unit/Organization	<u>Faculty of Engineering & Deslautels Faculty of Management</u>		

Project Team Members

The SPF encourages you to be inclusive, collaborative (especially between staff and students), diverse, and interdisciplinary when possible. To list more members, please complete a second cover page. You may email it to [SPF Staff](#) to include with your application.

Name	<u>Ben Hepditch</u>	Affiliation	<u>Undergraduate</u>
Email	<u>benjamin.hepditch@mail.mcgill.ca</u>	Faculty/Unit/Organization	<u>Arts and Science</u>
Name	<u>AldoAbou Chedid</u>	Affiliation	<u>Undergraduate</u>
Email	<u>aldo.abouchedid@mail.mcgill.ca</u>	Faculty/Unit/Organization	<u>Faculty of Engineering</u>
Name	<u>Mark Anthony Lorenc</u>	Affiliation	<u>Undergraduate</u>
Email	<u>mark.lorenc@mail.mcgill.ca</u>	Faculty/Unit/Organization	<u>Management</u>
Name	<u>Darcy Mazloum</u>	Affiliation	<u>Undergraduate</u>
Email	<u>darcy.mazloum@mail.mcgill.ca</u>	Faculty/Unit/Organization	<u>Faculty of Science</u>
Name	_____	Affiliation	<u>Choose one.</u>
Email	_____	Faculty/Unit/Organization	_____

SUBMISSION INFORMATION

In line with the [SPF Eligibility Criteria](#), our team certifies that this project takes place at [McGill University](#), is [sustainability focused](#), is requesting [seed funding](#), and is [action oriented](#).

Yes No

Our team has read the [SPF Terms & Conditions](#) and agrees to respect them.

Yes No

Our team understands that this application is not confidential and consents to have its contents shared with relevant stakeholders during the review process and, if approved, on the SPF website.

Yes No

Our team agrees to have [their contact information](#) included in the complete and shared application and, if approved, on the SPF website.

Yes No

PART 1: PROJECT OVERVIEW

Instructions: Please answer the questions below as clearly and concisely as possible. You will be able to detail your project further in Part 2 of the Over \$5,000 application process, the Project Plan, as well as submit relevant appendices. Once you have completed this Project Overview, save it and submit it online. SPF Staff will respond with feedback on your application within two weeks and send you Part 2. Once all sections are complete, the combined application will be provided to the SPF Governance Council for their review and decision. As a reminder, all SPF applications are assessed using the [SPF Eligibility & Evaluation Criteria](#):

ELIGIBILITY CRITERIA		EVALUATION CRITERIA		
AT MCGILL	SUSTAINABILITY FOCUSED	ANALYSIS	IMPACT	FEASIBILITY
SEED FUNDING	ACTION ORIENTED	COLLABORATION	SUPPORT	CAPACITY BUILDING

Before starting, you may find it helpful to consult the [SPF Sustainability Brief](#) and the [Climate & Sustainability Strategy 2020-2025](#).

CONTEXT



Criteria assessed in this section: **SUSTAINABILITY FOCUSED, ANALYSIS**

- 1. What specific sustainability-related need/issue have you identified at McGill and aim to address through your project? In your response, please describe clearly how the need/issue is related to sustainability. Note: Please wait to detail your project idea in response to Question 5. Limit ~100 words**

As students, we have noticed the absence of visible passionate leaders, intentionally working on innovative environmental technology and promoting a culture of sustainably purposed oriented technology. This lack of representation in turn limits students' awarness on the different ways technology can be used to support global sustainability goals. Therefore, our team is motivated to bridge the exisiting gap between sustainability and innovative technology at McGill. We are aware of the importance of inspiring all students to build a better world via concrete actions. Therefore, within our robotics team, we have decided to undergo a radical change of mindset and commit to promoting a culture of sustainability.

- 2. How do you know this is a need/issue? What research have you done on this need/issue (e.g. consultation, observation, survey)? Limit ~100 words**

As McGill's largest robotics-focused organization, we are aware that many students in our team are interested in sustainability but are not aware of how to use their academic background and interests to promote a culture of sustainability. Therefore, we researched various inspiring examples regarding the growing potential for robotics in the sustainability field. For example, the recent funding of an Autonomous Underwater Vehicle(AUV) to explore the depths of Yellowstone Lake for environmental documentation or the use of drones for forest and agricultural surveillance. As any field growing rapidly like this, it is necessary that sustainable ideas and practices in that field blossom in parallel.

- 3. What relevant information and/or best practices have you found that relate to this need/issue? In addition to information from external sources, detail any relevant related initiatives (past or current) that you are aware of at McGill. Limit ~100 words**

We found multiple research environmentally driven projects using drones for forest protection and animal welfare. Also, some AUVs are being used for ecosystem monitoring and repairing <https://transmitter.ieee.org/auvs-how-autonomous-und>

One that hits closer to our McGill community is a project by an undergrad biology student that won the Gault Research Award. She used drones equipped with a thermal imaging camera to survey the Reserve's white-tailed deer population. "This promising new tool could facilitate the work of biologists and help park managers keep an eye on the population sizes of species of interest" (<https://gault.mcgill.ca/en/news/detail/the-promise-and-challenge-of-using-drones-for-deer-surveys/>)

4. What expertise or qualifications does your team have regarding this need/issue, if any? *Limit ~100 words*

McGill Robotics is one of the longest-standing engineering design teams at McGill with around 150 active members. We are supported by a large alumni base that has found passion for the field and pursued it professionally. For example, one of our alumni has gone on to design environmentally-friendly electric motors. Another alumni, Nicholas Nadeau is a robotics expert and fractional CTO in Montreal and has committed to mentor us. Also, alumni, Colin Gallacher, is the founder and CEO of Haply Robotics a haptics company in Montreal who has also become one of our allies (See Appendix). Our team's overseeing professor is Meyer Nahon, he is our point of contact in academia and source of guidance when in need.

PROJECT IDEA

Criteria assessed in this section: **ALL ELIGIBILITY & EVALUATION CRITERIA**

5. What is your project idea? Please describe the idea thoroughly and concisely. Identify how SPF funding will be used, key contributions to sustainability at McGill, and, if your project is happening in different stages, core phases in the project. *Note: You may also share how the project is new or how it complements, builds upon, or scales existing initiatives. Limit ~400 words*

- Motivation: Inspire students to join McGill's sustainability culture movement by being visible sustainability leaders and supporters in the field of technological innovation.
- Core Objectives:
 - 1) Build two versatile and robust robots (one drone and one AUV) that can be used in different environmental monitoring research projects, educational programs/workshops and competitions, without having to be completely redesigned or rebuilt to fit each researcher's needs.
 - 2) Both robots should be able to map terrains, monitor animal movement and temperature.
 - 3) Test our robots and represent McGill's sustainability movement at international robotics competitions, and gain troubleshooting experience.
 - 4) Inspire students via events, summer school visits and workshops that showcase our robots' impact and our vision towards a more sustainable future supported by robotics.
 - 5) Collaborate with professors and researchers to test the performance of our robots
- Our current AUV (underwater autonomous vehicle) and our drone are not equipped with any environmental monitoring sensors. We have built prototypes for both robots but only the AUV prototype has been put to test at McGill's pool. It has shown positive results in regards to its operating software and buoyancy. For these projects to go past the prototype phase, we need seed-funding support. Until now, we have been working

with very old electronics (some of them 8-10 years old) and trying to make the most with what we have available at our workshop.

- Sustainability implications: For sustainability reasons, the goal is to avoid building a different robot for every specific application, instead we want to build two solid versatile robots that will be able to take on multiple needs. Given that terrain and animal movement monitoring usually require a helicopter, drones reduce the amount of gasoline needed during data collection. These robots will be able to provide long hours of constant and reliable surveillance and support multiple researchers reducing their need to buy drones in the longterm.

Events like our annual hackathon are the perfect place to foster and grow a culture for sustainability. This year, it was a massive 200-person event, based around SDGs it challenged students to build robots for sustainability applications.

After 1 year:

After testing our robots' capabilities thoroughly with the help of research and industry experts (see letters of support), we will be able to confidently support research projects

6. Is your project related to the University's [Climate & Sustainability Strategy 2020-2025](#)? Yes No
7. Is your project related to the University's [Equity, Diversity & Inclusion Strategic Plan 2020-2025](#)? Yes No
8. If you answered yes to Question 6 or 7, how does it relate? Please refer to the relevant strategy category, theme, goal, and/or action in your response. *Limit ~200 words*

Landscapes & Ecosystems is the main relevant category:

Our project will have a direct positive impact on the protection of biodiversity and well-being of McGill's ecosystems. It will also have the same impact on a larger scale through the support of research projects that need environmental data collection to succeed. It will also bring attention to the Gault Nature Reserve, inspire students to conduct research around biodiversity and motivate students to visit the reserve.

Research & Education is another relevant category:

This development will create an opportunity for students and researchers to learn about and collaborate on different sustainability issues that can be supported through robotics and other technological innovations, fostering a creating a culture of sustainability on campus. This initiative will also create a common platform, embodied by McGill Robotics, that will facilitate the sharing and reuse of our robots, as research assets. Furthermore, we aim to increase the involvement of faculty, alumni, and students of all levels, in robotics sustainability-focused events, such as Robohacks.

TRANSFORMING CAMPUS

Criteria assessed in this section: **AT MCGILL, IMPACT**

9. In the table below, describe your proposed project's 2-5 main impacts on the McGill community or its main goals to accomplish. Please check the stakeholders that will be impacted. Finally, list at least one key **success indicator** for each impact (e.g. # people will be engaged, % waste will be diverted, # buildings certified). *Note: Indicate a realistic target for each success indicator (e.g., rather than "# people engaged," include a target such as "50 people engaged").*

Main Impacts/Goals	McGill Stakeholders Impacted (check all that apply)	Key Success Indicator(s)
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REQUIRED	1	Build two versatile robots (drone & AUV) with environmental monitoring applications	<input type="checkbox"/> Undergraduate <input checked="" type="checkbox"/> Academic Staff <input type="checkbox"/> Postgraduate <input type="checkbox"/> Admin. Staff	Support research projects with varying needs without a redesign phase longer than 4 months.
	2	Both robots should be able to map terrains, monitor animal movement and temperature.	<input type="checkbox"/> Undergraduate <input checked="" type="checkbox"/> Academic Staff <input type="checkbox"/> Postgraduate <input checked="" type="checkbox"/> Admin. Staff	Pass precision and accuracy tests for data collection according to research standards.
OPTIONAL	3	Test our robots and represent McGill's sustainability movement at international competitions	<input checked="" type="checkbox"/> Undergraduate <input type="checkbox"/> Academic Staff <input checked="" type="checkbox"/> Postgraduate <input type="checkbox"/> Admin. Staff <input type="checkbox"/> Alumni	Attend to at least one competition for testing and progress reporting purposes
	4	Inspire students via events and workshops displaying the vision and impact of our robots	<input checked="" type="checkbox"/> Undergraduate <input type="checkbox"/> Academic Staff <input type="checkbox"/> Postgraduate <input type="checkbox"/> Admin. Staff <input type="checkbox"/> Alumni	Host one hackathon focused on sustainability goals, visit 3 different schools and host 2 workshops
	5	Collaborate with professors and researchers to test the performance of our robots	<input checked="" type="checkbox"/> Undergraduate <input checked="" type="checkbox"/> Academic Staff <input checked="" type="checkbox"/> Postgraduate <input type="checkbox"/> Admin. Staff <input type="checkbox"/> Alumni	Review performance and design with 3 professors/researchers and 2 alumni

10. Have you considered implementing your project at more than one McGill campus? (e.g. If your project is downtown, could it be implemented at Macdonald Campus as well?)

Yes No

11. Please describe your choice of campus(es) and why this choice is best for your project. Limit ~150 words

- Downtown campus: The Downtown campus is our main center of operations. We have our workshop and run most of our outreach community events there. The Downtown campus will also be the main meeting space to meet with academic and industry advisors/supporters.

- Gault Nature Reserve: There are several ways in which both of our robots can facilitate the research projects currently being run at the Gault Nature Reserve. For example, the white-tailed deer population monitoring. For more details, read "The Promise (And Challenge) of Using Drones for Deer Surveys - Gault Nature Reserve (mcgill.ca)"

- Macdonald Campus: Associate professor, Dr. Grant Clark, has confirmed the potential to use our drone to facilitate his research at MacDonald Campus. He has also filled our application's support form that can be found in the Appendix.

To complete the application process, please submit this form on the SPF website. The SPF Staff will be in touch regarding your application within two weeks and will send you Part 2 for the Over \$5,000 application process, the Project Plan.

PART 2: PROJECT PLAN

Instructions: Please answer the questions below as clearly and concisely as possible. Once you have completed this Project Plan, save it and submit it online. SPF Staff will respond with feedback on your application within 2 weeks. Once all sections are complete, the combined application will be provided to the SPF Governance Council for their review and decision. As a reminder, all SPF applications are assessed using the [SPF Eligibility & Evaluation Criteria](#):

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IMPLEMENTATION

Criteria assessed in this section: **ACTION ORIENTED, FEASIBILITY, IMPACT**

1. List the key **activities** for your project and indicate the timing for these on the right. Please be specific and realistic when formulating your activities, ensuring that they are achievable within the indicated timeframe.

Key Project Activities	Start Date (DD-MM-YY)	End Date (DD-MM-YY)
Building robot prototypes considering the integration of the environmental monitoring devices	01-05-2023	30-06-2023
Testing robot prototypes' capabilities at competitions and at McGill facilities	20-06-2023	15-08-2023
Engaging with stakeholders regarding the specific criteria related to environmental data collection	16-08-2023	16-10-2023
Using acquired information in the steps above to transform our prototypes into the desired robots	17-10-2023	10-01-2024
Training and integration of new members to our current robot design and goals	01-09-2023	01-11-2023
Planning and hosting a variety of large and small events to promote a culture of sustainability	01-05-2023	30-04-2024
Integration and testing of environmental monitoring capabilities	05-01-2024	05-05-2024
Hosting RoboHacks our annual robotics hackathon based on SDGs	08-03-2024	10-03-2024
Showcase new functionalities on downtown campus to promote sustainability in engineering	01-03-2024	continuously
Reviewing and testing robots with academia and industry experts	01-03-2024	01-08-2024
Creating reports highlighting the main take aways of competition and stakeholder feedback	01-08-2023	01-08-2024
*Refer to our Appendix for our timeline diagram		

2. Please describe what will happen to your project after the SPF funding ends. Additionally, please share if anything will be produced or installed (e.g. a workshop guide, equipment, a toolkit, a network, website, etc.) and indicate future maintenance plans. *Limit ~200 words*

After a year, when SPF funding ends, we will be able to confidently offer our support to environmentally driven research projects. Our team will have built the necessary background to troubleshoot and address shortcomings related to the use of our robots. We will continue to promote a culture of sustainability at McGill through events, workshops and social media. Additionally, we will continue to recruit and mentor students to introduce them to robotics and its sustainable applications. We will continue to evaluate the robots' performance in competition and keep improving them to ensure that their capabilities are optimized for research use.

Financially, moving forward, the funding requirements from our robots will primarily come from any damages sustained during testing or our electronics reaching their end of life cycle which, on average, is 10 years. In regards to software maintenance, the requirements are minimal given that we build most of our software in-house. We are also able to take on any mechanical or electrical repairs in-house.

Therefore, the required funding after SPF funding ends should be minimal compared to what we are asking in this application.

3. Please list any potential risks associated with your project and the measures you will take to reduce their likelihood.

Main Risks	Preventative Measures
Robots or components are 1) damaged or 2) stolen	1) Develop clear guidelines that outline proper robot usage 2) Purchase lockable storage units
Inability to meet design requirements of stakeholders due to insufficient expertise	Adequately train all members and proactively set meetings with advisors and industry professionals
Failure to meet milestones as set out in the timeline	Regularly revise and asses progress towards goals. Re-evaluate resource allocation if needed

STAKEHOLDER ENGAGEMENT

Criteria assessed in this section: **AT MCGILL, COLLABORATION, SUPPORT, CAPACITY BUILDING**

4. Please list all the key stakeholders involved in your project, indicating their role and support. If the stakeholder has provided a support letter, please indicate so here and attach it as an appendix document. *Note: Projects involving modifying a space on campus, making a permanent installation, hiring a full-time staff, or adding/modifying a garden, etc., must seek permission from the appropriate stakeholder(s) (e.g. building director, Campus Planning and Development Office, staff supervisor, etc.). SPF Staff can help you assess if any key stakeholders need to be added to your list.*

Stakeholder's Name(s)	Title	Role in the Project	Support/Permission	Support Letter
Dr. Gregory Dudeck	James McGill Professor of Computer Science	Advisor	Confirmed	No
Dr. Mayer Nahon	Mechanical Engineering Professor	Advisor and Team Supervisor	Confirmed	Yes
Michael Sitruk	Project Development Officer	Supporter and collaborator for school visits	Confirmed	Yes
PhD Candidate. Maxana Weiss	Co-Lead Site Coordinator	Let's Talk Science Coordinator and collaborator	Confirmed	Yes
P.Eng Nicholas Nadeau	Founder of Nadeau Innovations and	Robotics Expert Advisor	Confirmed	Yes
Colin Gallacher	CEO and Founder of Haply Robotics	Advisor	Confirmed	No
Dr. Grant Clark	Associate Professor in Bioresource Eng. Dep.	Supporter and potential research collaborator	Confirmed	No
Dr. Inna Sharf	Professor	Advisor	Requested	No
Dr. Kyle Elliott	Associate Professor	Supporter and potential research collaborator	Requested	No
			Choose one.	Choose one.

5. How will you communicate about your project and share its impacts with your stakeholders and the McGill community? Please describe your tactics (e.g. social media, workshops, tabling, newsletters, etc.) and any related timing (e.g. at the beginning, during, or after the project). Related activities can also be included in **Question 1**. *Limit ~200 words*

We will promote our projects and their sustainable goals at various tabling events throughout the year, namely EUS Clubs Day, SSMU Clubs Fair, and the POWE tabling event. Beyond tabling, we will continue to expand our brands influence on social media platforms like LinkedIn and Instagram and highlight our contributions to promoting sustainability in the McGill community through collaborations with researchers and external organizations, as well as outreach events like school visits. We will carry out our social media campaign over the project's entire lifespan. Finally, we will promote our project through what is, by far, our most impactful event, RoboHacks, a robotics hackathon built around the UN sustainability goals, which we will host at the end of Fall 2023 or beginning of Winter 2024.

6. If applicable, are there any training, volunteer opportunities, jobs, or complementary applied student research integrated in your project? Please describe. *Limit ~100 words*

Our hope is to create unique research opportunities for students outside the faculty of engineering, specifically those researching topics related to sustainability and the environment, by providing them with high-tech robotic tools. Beyond research projects, our team is the only organization at McGill where students can get practical hands on experience building robots. Our training already covers state-of-the art tools used in industry, but we will expand this to include AI ethics and the importance of integrating sustainability into everything we do. Finally, our outreach trips to local schools grant students opportunities to gain valuable community-based volunteer experience.

PROJECT BUDGET

Criteria assessed in this section: [FEASIBILITY](#)

Revenues

Indicate any funding you will receive or may receive to complete your project, including funds from McGill departments and units.

Funding Source(s)	Amount Requested	Request Status
Sustainability Projects Fund (SPF)	\$61,025.76	Requested
SSMU Community Engagement Fund	\$17,000.00	Plan to request
	\$0.00	Choose one.
	\$0.00	Choose one.
REVENUES GRAND TOTAL (must match Expenses Grand Total)	\$78,025.76	

Expenses

Indicate your project expenses below. Please remember to include tax and shipping costs, if any.

Item Description	Unit Cost	# of Units	Total Cost	Expense paid by SPF?
AUV Budget Proposal	\$30,050.00	1	\$30,050.00	Yes, fully
Drone Budget Proposal	\$30,975.76	1	\$30,975.76	Yes, fully
Hosted Events for the community	\$17,000.00	1	\$17,000.00	No
			\$ 0.00	Choose one.
	\$0.00		\$ 0.00	Choose one.
	\$0.00		\$ 0.00	Choose one.
	\$0.00		\$ 0.00	Choose one.
	\$0.00		\$ 0.00	Choose one.
	\$0.00		\$ 0.00	Choose one.
	\$0.00		\$ 0.00	Choose one.
	\$0.00		\$ 0.00	Choose one.
	\$0.00		\$ 0.00	Choose one.
	\$0.00		\$ 0.00	Choose one.
	\$0.00		\$ 0.00	Choose one.
	\$0.00		\$ 0.00	Choose one.
	\$0.00		\$ 0.00	Choose one.
	\$0.00		\$ 0.00	Choose one.
REFER TO APPENDIX FOR DETAILED ITEM DESCRIPTION	\$0.00		\$ 0.00	Choose one.
Expenses Subtotal			\$78,025.76	

Salaries & Wages

If applicable, please indicate any paid positions needed for your project. Please note: if you complete this Salaries & Wages section, you must also complete the [Staff Position Information Appendix](#).

Position Title	~# Hours per Week	~# Weeks	Hourly Wage	Subtotal	+ 20% Benefits	Total Cost	Funding Sources
			\$0.00	\$ 0.00	1.2	\$ 0.00	
			\$0.00	\$ 0.00	1.2	\$ 0.00	
			\$0.00	\$ 0.00	1.2	\$ 0.00	
			\$0.00	\$ 0.00	1.2	\$ 0.00	
Salaries & Wages Subtotal						\$ 0.00	

EXPENSES GRAND TOTAL (must match Revenues Grand Total)	\$78,025.76
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APPENDIX

Relevant Support Documents

List any appendix documents in order in the table below.

Please keep the total number of pages as low as possible (recommended max 10). Please include any relevant support letters.

Doc #	Appendix Document Title	# of Pages
1	AUV Detailed Budget Description	
2	AUV Detailed Project Overview	
3	Drone Detailed Budget Description	
4	Drone Detailed Project Overview	
5	Support letter Dr.Meyer Nahon	
6	Support letter Michael Sitruk	
7	Support letter PhD Candidate. Maxana Weiss	
8	Support letter P.Eng Nicholas Nadeau	
9		
10	Staff Position Information Appendix , if applicable	