Carleton UNIVERSITY

GENDERED DESIGN IN STEAM

Gendered Design in STEAM (GDS) in Lower- and Middle-income Countries (LMIC)

Science, Technology, Engineering, Arts and Mathematics

The overall objective of the GDS program is:

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To build capacity for research, design and dissemination of gendered innovations in Science, Technology, Engineering, the Arts and Mathematics (STEAM), addressing challenges predominantly faced by women in low- and middle-income countries (LMICs).

Responding to gaps in gendered design and innovation research, the GDS program aims to:

- connect, expand and enhance the community of experts and innovators in gendered design, particularly in LMICs;
- support LMIC researchers in conducting research case studies on current and past gendered innovations, and in designing gendered projects, driven by local interests ; and
- make gender challenges in the design of technologies and processes more visible to researchers, designers and innovators, particularly in LMICs.

Gendered design as a growing field of knowledge seeks to:

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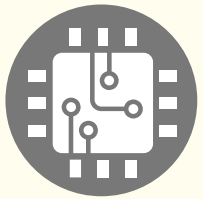
- identify and overcome gender bias from the knowledge base of a broad spectrum of fields that practice design processes;
- identify, support and promote socially and culturally aware approaches to design and development that can foster more equitable relationships, interactions and dynamics;
- ensure new products and processes are effective and inclusive, from their research phases to their initial applications, and onward.

Gendered design processes bring diverse perspectives, which reshapes how we identify design challenges, the solutions to these challenges, as well as the reach of their benefits.

STEAM

Science is a knowledge discipline that uses experiential observations as a method for evaluating the validity of the information. Different branches of science include chemistry, physics and biology.

Mathematics is an area of study that uses deductive reasoning, abstraction, and logic in a quantifiable manner to understand the world. It can range from statistics to geometry.



Technology is a crosscutting area where development of tools through specific techniques, practices and processes occur. Technology may be applied to various sectors, including medicine, where biotechnology such as vaccines are used. Other examples include wind turbines in the renewable energy sector.

The **Art** domain is concentrated on expressions of creativity found in human cultures and societies through skills and imagination in order to produce objects, environments, and experiences. Major constituents of the arts include visual arts, literature, and performing arts.

Engineering is a discipline focused on the design and construction of machines, buildings, and other structures, and can include, for example, bridges, tunnels, and vehicles.

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Infrastructure is the physical systems of a business, region, or nation. For instance, transportation systems, communication networks, sewage, water, and electric systems are all examples of infrastructure.

Built environment & housing encompasses places and spaces created or modified by people to serve their needs for accommodation, organisation and representation. It covers architecture, landscaping, housing, public space and access to resources, such as a proximity to grocery stores.

Renewable energy sector is focused on deriving energy from natural processes that are replenished at a rate that is equal to, or faster than, the rate at which they are consumed. There are various forms of renewable energy, including wind energy, solar, and hydropower.

Manufacturing sector engages in the mechanical, physical, or chemical transformation of materials, substances, or components into new products. It is most commonly applied to industrial design, in which raw materials are transformed into finished goods on a large scale. Examples of manufactured goods include aircraft parts, household appliances and handicrafts.

Transport & mobility deals with the movement of people and products locally as well as internationally. It links people to jobs, delivers products to consumers, and connects regions and communities to each other and to international markets. It serves and attracts domestic and international trade. Examples include railroads, shipping and public transport.

Accessibility refers to the design of products, services, and/or environments so it is usable and accessible for people with disabilities and those who face, for example, financial or class barriers. Examples can include assistive technologies on websites, street design for wheelchair users and improving access to services that are usually unattainable in current systems.

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Carleton awards 20 grants

The 20 selected GDS research teams come from Africa, Asia, and Latin America.

The teams work in a variety of fields that practice design processes, but they share a common goal:

to identify and overcome gender bias and tackle issues especially affecting women in lower- and middle-income countries.

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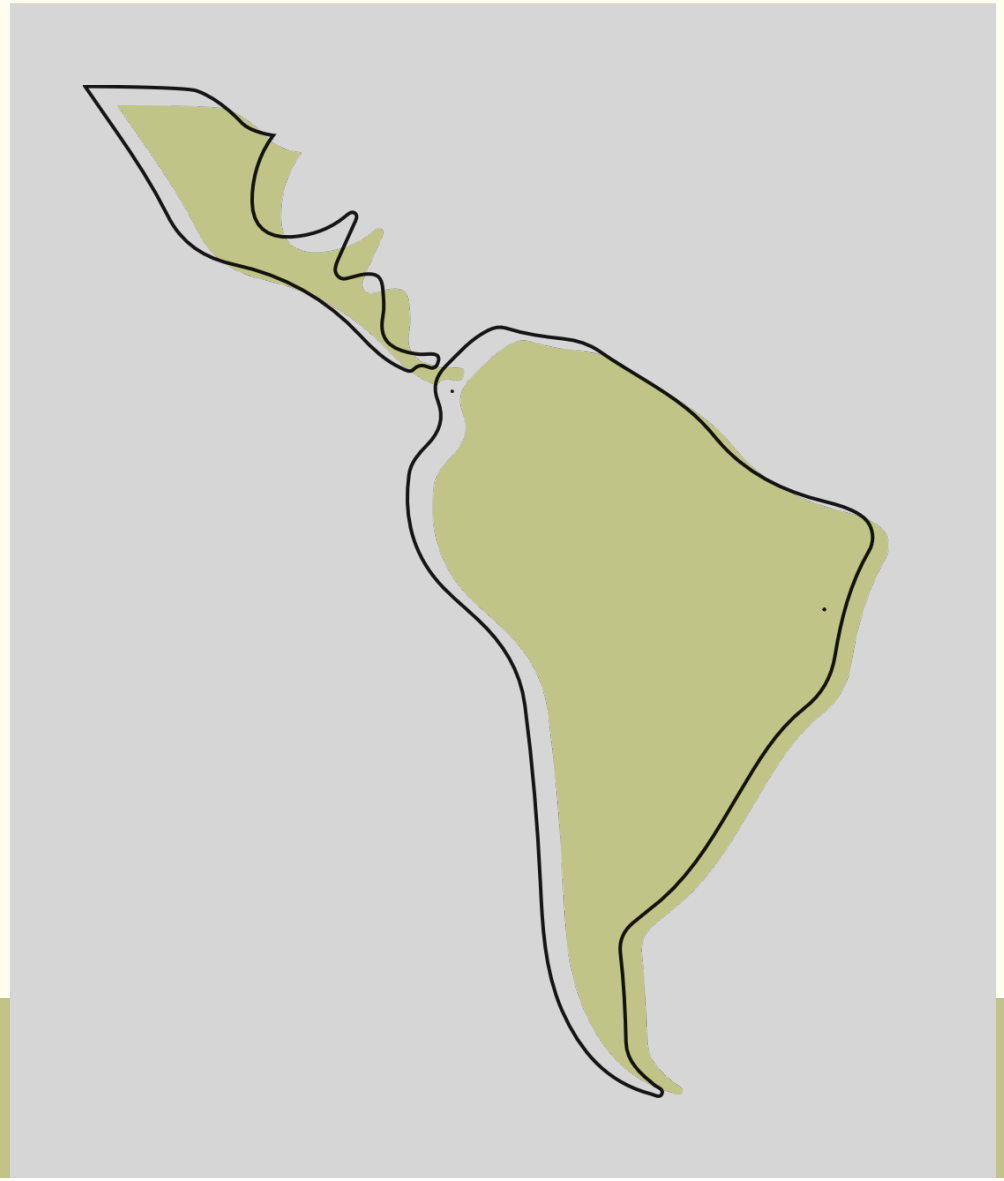
The GDS Program is funded by the International Development Research Council (IDRC)



LATIN AMERICA

GENDERED DESIGN IN STEAM

- Centro de Intercambio y Servicios Para el Cono Sur Argentina (CISCSA) – Ciudad Feminista, **Argentina**
- Universidad de Buenos Aires (UBA), **Argentina**
- Universidade Estadual Paulista (UNESP), **Brazil**
- Universidad Autónoma de Ciudad Juárez (UACJ), **Mexico**
- Universidad de Bogotá Jorge Tadeo Lozano (UTADEO), **Colombia**
- Universidade Federal de Alagoas (FAU/UFAL), **Brazil**
- Universidade Federal de Pernambuco (FADE-UFPE), **Brazil**
- Universidade Federal de São Paulo (UNIFESP), **Brazil**

Exploring urban childcare infrastructures to support women's autonomy in Argentina

ID37

Using the public childcare systems of Córdoba as a case study, this project will highlight the omission of women in urban planning and how this influences their daily lives. The study will produce qualitative maps and new research in order to argue for a feminist approach to urban planning. Cartography will be a tool to bring new arguments to the debate, while focusing specifically on how low-income women experience the public childcare infrastructures of Córdoba, in Argentina.

Primary investigator:
Professor Ana Falú

Co-Primary investigator:
Mgt. Eva Lia Colombo

Institute:
Centro de Intercambio y Servicios Para el Cono Sur Argentina (CISCSA) – Ciudad Feminista
www.ciscsa.org.ar

Location:
Córdoba, Argentina

Grant stream:
One – case study

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Re/designing the University of Buenos Aires campus to be gender inclusive in Argentina

ID41

This case study aims to develop a guideline for designing and redesigning university spaces to be more gender inclusive. The guideline will be based on user-feedback gathered through in-depth interviews, focus groups, field observation and surveys on the University of Buenos Aires campus. This information will be available for other educational institutions interested in implementing the guideline in order to create university spaces that are more accessible and gender inclusive.

Primary investigator:
Dr. Carolina Spataro

Co-Primary investigator:
Professor Griselda Flesler

Institute:
Universidad de Buenos Aires (UBA)
www.uba.ar

Location:
Buenos Aires, Argentina

Grant stream:
One – case study

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A case study of ergonomic design considerations of low-income, menopausal women in Brazil

ID53

This case study aims to produce usability standards of clothing for low-income women going through the menopause in Brazil. The researchers will conduct interviews to better understand the bodily changes, behaviour, and emotions of menopausal women in order to develop clothing design guidelines that promote security and comfort.

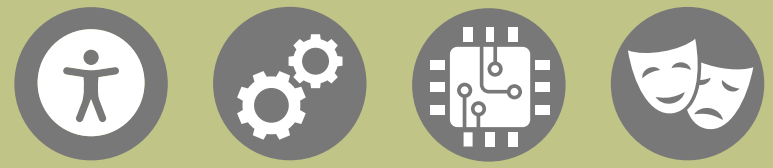
Primary investigator:
Érica Neves

Co-Primary investigator:
Titular Professor Luis Carlos Paschoarelli

Institute:
Universidade Estadual Paulista, (UNESP)
www2.unesp.br

Location:
São Paulo, Brazil

Grant stream:
One – case study



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Developing innovative urban design strategies to combat gender violence in Mexico

ID61

This research project will study the impact of urban design on gendered violence by adopting innovative, interdisciplinary strategies in urban public spaces in Ciudad Juárez in Mexico. Communication and collaboration between academics, key stakeholders in civil society, educational institutions, and government will allow for a more thorough understanding of gender-based violence in urban public spaces from a local perspective. A seminar involving an interdisciplinary group of collaborators will serve to contextualize how urban design has negatively impacted women and children in Ciudad Juárez. A prototype designed to help prevent gender violence will be created.

Primary investigator:
Dr. Erika Anastacia Rogel Villalba

Co-Primary investigators:
Dr. Leonardo Moreno
Dra. Lourdes Ampudia

Institute:
Universidad Autónoma de Ciudad Juárez (UACJ)
www.uacj.mx

Location:
Ciudad Juárez, Mexico

Grant stream:
Two – case study & prototype

GENDERED DESIGN IN STEAM

Reimagining urban territories for women's autonomy in Colombia

ID80

This research project aims to support an ongoing group of women in the neighborhood of Belén in Bogotá, by engaging them and other fellow residents in participatory and collaborative strategies. This will occur in four stages: building a community kitchen and expanding an existing community garden; critical mapping of Belén; identifying areas in the neighborhood for interventions like murals; and consolidating the findings to propose a conceptual framework for design as a field, taking into consideration women's empowerment and autonomy. This project builds on ongoing work in the neighborhood that seeks to establish ways of re-appropriating participants' community space and activities in the midst of gentrification and redevelopment efforts, from a gender perspective.

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Primary investigator:
Associate Professor Adriana María Botero Vélez

Co-Primary investigator:
Associate Professor Pablo Calderón Salazar

Institute:
Universidad de Bogotá Jorge Tadeo Lozano, (UTADEO)
www.utadeo.edu.co

Location:
Belén, Bogotá, Colombia

Grant stream:
Two – case study & prototype

Developing new construction techniques based on the work of women in Brazil

ID88

The research project is based on a housing movement called “Mutirao” which emerged at the end of the 1980s, where residents construct residential areas on the outskirts of populated cities in Brazil. This collective activity is usually led by women (around 80%), and they organize, coordinate and work on-site and in management. The project aims to work on the organizational design of construction sites, materials, tools and/or protective pieces of equipment, in order to support women working in the construction of their homes. Experimental research will be carried out in laboratories and through prototyping. The aim of the study is to create manuals and equipment for construction sites led by women, reduce the risk of accidents, search for techniques that are less harmful to builders’ health, and collectivize and de-hierarchize the knowledge of construction.

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Primary investigator:
Professor Diana Helene Ramos

Co-Primary investigator:
Amanda Azevedo Nunes

Institute:
Universidade Federal de Alagoas (FAU/UFAL)
www.ufal.br

Location:
Maceió, Brazil

Grant stream:
Two – case study & prototype

Studying the use of artifacts to improve self-image and identity among female breast cancer patients in Brazil

ID91

This case study qualitatively analyzes the individual and social well-being of female breast cancer survivors who underwent mastectomies in Pernambuco, Brazil. The project will include workshops, interviews and exhibitions. Workshops using different techniques, such as clay, photography and other mediums will help to understand how artifacts are used as a strategy to improve self-image and identity during and after cancer treatment. The findings will be shared across academic and non-academic circles in order to raise awareness of, and support for, post-surgery female breast cancer survivors.

Primary investigator:
Ma. Débora Ferro

Co-Primary investigator:
Dr. Kátia Medeiros de Araújo
Dr. Rosiane Pereira Alves

Institute:
Fundação de Apoio ao Desenvolvimento da Universidade Federal de Pernambuco (FADE-UFPE)
www.ufpe.br

Location:
Pernambuco, Brazil

Grant stream:
One – case study

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3D-printed prostheses to support female survivors of domestic violence, accidents or cancer treatment in Brazil

This research project examines the effects of providing visually and/or mechanically enhancing prostheses to low-income women with visible disabilities caused by domestic violence, accidents or cancer treatment. A first round of prostheses provided to the women improved their quality of life in many ways, including their social inclusion, self-worth, confidence, and independence. Supported by the experiences from the first round, this project will make modifications to a second round of 3D-printed prostheses, including the nose, ear, breast and upper lip, to further improve the outcome for the women. Rehabilitation and psychological support for the women have been integrated into the project design.

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IDA

Primary investigator:
Dr. Maria Elizete Kunkel

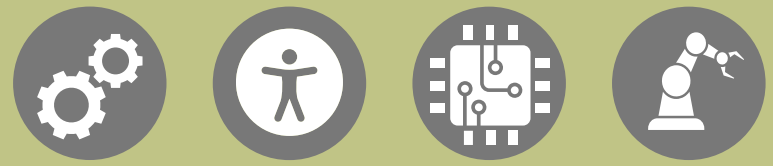
Co-Primary investigators:
Professor Luciana Ferreira
Professor Felipe Moura (UEL)

Institutes:
Universidade Federal de São Paulo (UNIFESP) www.unifesp.br

Universidade Estadual de Londrina (UEL) www.uel.br

Location:
Brazil

Grant stream:
Two – case study & prototype



ASIA

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- Middle East Technical University, **Turkey**
- Lahore University of Management Sciences (LUMS), **Pakistan**
- Multimedia University (MMU), **Malaysia**

Improving the design of public transport based on women's experiences in Turkey

ID17

This project seeks to explore the connections between transportation design and gender in Ankara, Turkey by examining women's experiences. This research project intends to generate more equitable guidelines and inclusive design ideas to improve transportation for women in Ankara. Through semi-structured interviews and a workshop, involving student proposals from METU's school of design, proposed improvements for transportation systems will be explored with women commuters.

Primary investigator:
Dr. Pinar Kaygan

Co-Primary investigator:
Dr Asuman Özgür Keysan

Institute:
Middle East Technical University (METU)
www.metu.edu.tr

Location:
Ankara, Turkey

Grant stream:
One – case study

GENDERED DESIGN IN STEAM

Designing support services for women experiencing workplace harassment in Pakistan

ID38

This project aims to develop guidelines to create technologies for low-literate factory women who work in oppressive circumstances. Women's experiences will directly support the development. It also seeks to develop a prototype application that would give women access to a safe, private and anonymous network to share experiences of workplace violence to find support.

Primary investigator:
Dr. Maryam Mustafa

Co-Primary investigator:
Dr. Hadia Majid

Institute:
Lahore University of Management Sciences (LUMS)
www.lums.edu.pk

Location:
Lahore, Pakistan

Grant stream:
Two – case study & prototype

GENDERED DESIGN IN STEAM

Designing mobile services for ageing women in Malaysia

ID50

This case study will look at gender and age differences in mobile use preferences and behaviour patterns. Data will be collected through focus groups and surveys to understand mobile use. The findings will inform the design of mobile apps to increase smartphone ownership use among ageing women in Malaysia.

Primary investigator:
Dr. Chui Yin Wong

Co-Primary investigators:
Associate Prof. Dr KOO Ah Choo (MMU)
Dr Yvonne LEE (MMU)
Dr LAI Wan Teng (USM)
Hazwan Mat Din (UPM)

Institute:
Multimedia University (MMU)
www.mmu.edu.my
Universiti Sains Malaysia (USM)
Universiti Putra Malaysia (UPM)

Location:
Cyberjaya, Malaysia

Grant stream:
One – case study

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AFRICA

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- Addis Ababa University, **Ethiopia**
- University of Energy and Natural Resources, **Ghana**
- University of Uyo, **Nigeria**
- Lagos State University, **Nigeria**
- Edo State Polytechnic Usen, **Nigeria**
- University of Mauritius, **Mauritius**
- University of Rwanda, **Rwanda**
- University of Rwanda, **Rwanda**
- University of Dar es Salaam, **Tanzania**

Improving access to financial services for women in Ethiopia

ID33

This project aims to provide financial services to women in Ethiopia through a mobile app. The researchers aim to conduct a survey in order to develop a prototype that addresses the needs and concerns of women in Ethiopia.

Primary investigator:
Dr. Getachew Mengesha

Co-Primary investigator:
Dr. Elfelios Getachew
Dr. Moges Ayele

Institute:
Addis Ababa University
www.aau.edu.et

Location:
Addis Ababa, Ethiopia

Grant stream:
Two – case study & prototype

GENDERED DESIGN IN STEAM

Assessing the impact of solar panels to improve energy access for women in rural Ghana

ID40

The government of Ghana aims to provide energy access to communities with populations of 500 and above, but isolated communities (rural or island) have no access to electricity. In order to provide electricity access to these communities, many solar systems have been implemented. This case study will explore the factors enhancing women's empowerment through energy access, investigate productive uses of energy in informal food preparation and processing sectors owned by women and vulnerable populations. It will assess the impact on energy access and gender and the political economy of the energy sector in these communities and enhance the role of the private sector in scaling up energy access for all.

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Primary investigator:
Dr. Samuel Gyamfi

Co-Primary investigators:
Dr. Danielle Sedegah
Dr. Eric Ofosu Antwi

Institute:
University of Energy and Natural Resources (UENR)
www.uenr.edu.gh

Location:
Volta Region, Ghana

Grant stream:
One – case study

Improving the design of upland fish drying technology for female fish vendors in Nigeria

ID47

The case study targets fish drying and processing facilities that are primarily used by female workers. As it currently stands, female fish dryers experience excessive strain as a result of substandard technology and working conditions. The research outcomes seeks to alleviate some of the physical strain and increase overall industry value. Methods include obtaining demographic information, identifying desirable and gender-conscious improvements in fish drying technology and/or facilities, and investigating some knowledge gaps. The research will investigate the needs of local communities to create detailed plans for improved drying and processing facilities.

Primary investigator:
Dr. Uduakobong Aniebiat Okon

Co-Primary investigator:
Mrs. Otu Ebeten Bassey

Institute:
University of Uyo
www.uniuyo.edu.ng

Location:
Akwa Ibom State, Nigeria

Grant stream:
Two – case study & prototype

GENDERED DESIGN IN STEAM

Developing a hybrid fish dryer to improve processing for small-scale female processors in Nigeria

ID57

The research project involves the development and integration of a solar and biomass-powered fish dryer in Lagos State in Nigeria. Local methods of fish drying and preservation are inefficient and negatively impact on health and well-being. The research plans to co-produce a hybrid solar/biomass fish dryer with local end-users, primarily a female labour force, to reduce the negative effects of the fish preservation process. Problems such as energy intermittency and inefficiency or waste in the process will be targeted as well as identifying requirements that are unique to the female labour force.

Primary investigator:
Dr. Kafayat Adetoun Fakoya

Co-Primary investigators:
Ms. Ayojesutomi O. Abiodun-Solanke
Prof. Adenike Omotunde Boyo
Prof. Shehu Latunji Akintola
Dr. Kafayat Oluwakemi Ajelara

Institute:
Lagos State University
www.lasu.edu.ng/home

Location:
Lagos, Nigeria

Grant stream:
Two – case study & prototype

GENDERED DESIGN IN STEAM

Constructing an eco-friendly generator for low-income female artisans in Nigeria

ID65

This research project aims to design and construct a fuel-less generator, capable of producing a sustainable, accessible and environmentally friendly electrical power machine to support female artisans operating in small and medium scale business ventures in Nigeria. The project aims to construct a generator that improves gender equality by developing cheap and robust methods that incorporate the cognitive, emotional and cultural needs of female artisans.

Primary investigator:
Mrs. Ese Esther Oriarewo

Co-Primary investigator:
Dr. Obokhai Kess Asikhia

Institute:
Edo State Polytechnic Usen
www.edopoly.edu.ng

Location:
Edo State, Nigeria

Grant stream:
Two – case study & prototype

GENDERED DESIGN IN STEAM

Developing small wind turbines with local women for domestic use in Mauritius

ID71

This research project aims to design and develop a prototype model and a system for a small-scale vertical-axis wind turbine which can later be scaled-up for domestic use in Mauritius. The prototype model and system design will involve local resources as much as possible, engaging women in particular in the design process. The prototype will be simulated for different income-groups with different energy demand profiles in rural, urban and coastal areas.

Primary investigator:
Dr. Mohammad Khalil Elahee

Co-Primary investigator:
Dr. Abdel Khoodaruth

Institute:
University of Mauritius
www.uom.ac.mu

Location:
Reduit, Republic of Mauritius

Grant stream:
Two – case study & prototype

GENDERED DESIGN IN STEAM

Improving the design process for housing and public spaces based on women's experiences in Rwanda

ID73

This case study will identify gender issues in the design of housing, built environments and public spaces in Rwanda. It will consider the impact of the built environment on women that is usually designed without their involvement. Data collection will include surveys and face-to-face interviews. The findings will be used to create guidelines and a framework to use when designing housing and public spaces to support greater equal access regardless of gender.

Primary investigator:
Dr. Marie Chantal Cyulinyana

Co-Primary investigator:
Mrs. Roselyne Ishimwe

Institute:
University of Rwanda
www.ur.ac.rw

Rwandan Association for Women in Science and Engineering (RAWISE)

Location:
Kigali City, Rwanda

Grant stream:
One – case study

GENDERED DESIGN IN STEAM

Improving transportation systems for women in Rwanda

ID74

This case study seeks to develop a framework of guidelines for safer transportation for vulnerable populations in Kigali City, Rwanda. The proposal defines vulnerable as including women, people with disabilities, the elderly, and children. Through structured and semi-structured interviews, focus groups, and surveys this project seeks to understand how transit user groups, with a focus on women, utilize the transportation systems. The results will provide a framework to create more responsive systems that take these experiences into consideration. The data collected includes number and length of trips, what participants travel with, and whether participants travel accompanied.

Primary investigator:
Dr. Didacienne Mukanyiligira

Co-Primary investigator:
Mrs. Marie Grace Umumararungu

Institute:
University of Rwanda
www.ur.ac.rw

Location:
Kigali City, Rwanda

Grant stream:
One – case study

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Modernizing the batik industry to improve income for women in Tanzania

ID79

This research project aims to modernize the batik production process in Tanzania to assist women in becoming the primary batik producers. This modernization will provide women in Tanzania a higher and more sustainable income towards alleviating poverty. The first phase of the project will focus on establishing techniques for local producers to create higher quality batik, and the second phase will work with artists to develop new motif designs and patterns for batik.

Primary investigator:
Dr. Pendo Bigambo

Co-Primary investigators:
Dr. Mbonea Mrango
Ms. Safina Kimbokota

Institute:
University of Dar es Salaam
www.udsm.ac.tz

Location:
Dar es Salaam, Tanzania

Grant stream:
Two – case study & prototype

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The GDS program is supported by an interdisciplinary collection of experts based at Carleton, in collaboration with regional experts:

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Co-Primary Investigator

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Investigator

Kerry Grace
Program Coordinator

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Fred Afagh
Jill Wigle
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Owen Rowland
Ozayr Saloojee
Tracey Lauriault
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Regional Experts

Emmanuel Mutungi – Africa

Raquel Noronha – Latin America

Yoko Akama – Asia

Gender Expert

Amina Mire

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