



H.E.R

Health, Empowerment and Respect for the women of Mayukwayukwa

It's a Cycle...Period.

The University of Melbourne
Engineers Without Borders *Challenge* 2016

Executive Summary

“There is no tool for development more effective than the empowerment of women” – Kofi Annan

When crises such as famine, war or climate change hit isolated communities around the world, organisations such as the United Nations Refugee Agency (UNHCR) and Engineers Without Borders (EWB) provide life-changing humanitarian support to those who need it the most. The UNHCR and EWB are committed to positive social change and support developing communities in the improvement of their lives with engineering and technical solutions for sustainable development.

It is vital that all projects designed in partnership with the UNHCR and EWB focus on the specific needs of the people within the communities in question.

This year, the 2016-17 EWB Challenge focuses on the UNHCR’s work in the Mayukwayukwa refugee settlement in the Kaoma District of Zambia’s Western Province. The community comprises over 11,000 refugees, with the majority of whom having fled the Angolan War of Independence from 1961 to 1974 (EWB, 2016). The rest of the community is made up of refugees from the Democratic Republic of Congo, Burundi and Rwanda.

For the EWB Challenge in Mayukwayukwa this year, our group has concentrated on Water, Sanitation and Hygiene (WASH), focusing on female hygiene and menstruation in

particular. The main issue within this design area is that women currently have no sustainable method of managing their menstruation. The UNHCR currently gives women *chitenges* or large pieces of fabric that are cut up into strips and used as makeshift sanitary pads. The *chitenge* distribution events are few and far in between, and this means that the number of women who go without them is high. For the women that do have *chitenges*, there is still significant social and cultural taboo surrounding menstruation causing them to wash and dry the strips discreetly, poorly and unhygienically. This social taboo also means that women who do not own *chitenges* are forced to remain at home, segregated from school, work and their community for the duration of their periods.

In order to address these issues, our team has proposed the implementation of the pads for H.E.R and the enactment of the education for H.E.R. The combination of these two projects will facilitate the improvement of MHM in the community as well as improve their health and empower women and by extension, the whole community. With consistent consideration of the culture and traditions of the women in Mayukwayukwa surrounding menstruation health management (MHM), our team has created a design proposal that will enable women to handle their periods safely and sustainably within their community.

Consideration of the following factors has ensured that our proposed design options are appropriate to the Mayukwayukwa and Zambian community:

Project Sustainability – By engaging the community in the process of implementing the project, the aim is to create a sense of ownership over the project, ensuring the long-term continuation.

Community Impacts – First and foremost, our design will impact women and girls in the community who experience difficulty with MHM. In addition, the creation of business opportunities in creation of the pads, as well as the equal education of girls and boys will have a positive flow-on effect benefitting all stakeholders in the community.

Culture and Society – In Mayukwayukwa, the significant social taboos associated with menstruation causes women to refrain from engaging with their community while they are on their periods. Our design proposal of H.E.R aligns with the current cultural and social practice of these women using some form of reusable cloth sanitary pad and drying them discreetly.

Community Engagement – By engaging the community in the process of applying the project from manufacturing to distribution of the pads for H.E.R, as well as the implementation of the education for H.E.R, the successful adoption and longevity of the project will be ensured.

Environmental Impact – The implementation of a reusable cloth pad will mitigate the negative environmental impacts associated with plastic non-biodegradable disposable pads.

Economic Costs – The cost of the project will be low due to locally sourced materials and manpower allowing community members to implement the project with minimal financial aid. In addition, the creation of a pad distribution micro-enterprise provides potential future economic

benefits to the Mayukwayukwa community.

Technical design – The technical design of H.E.R is appropriate for the community as it is sufficiently simple, ergonomically sound, and can be implemented and prototyped rapidly in the community.

Materials – The use of locally available materials that build on the use of cotton *chitenge*, the materials used in the pads for H.E.R is both culturally acceptable and environmentally friendly. This also allows for a reduction of manufacturing costs.

Program Implementation – The implementation of the project would harness the existing skills, networks and knowledge of local women’s groups in the community. By utilising local labour, the project will build the community’s capacity for self-sufficiency.

The final long-term outcome of our project is to eliminate the taboo surrounding menstruation and to empower women in the community. Our group recognises that this process is extremely complex and will take years to achieve. Because of this, our group has designed the pads for H.E.R and the education for H.E.R to ease the current short-term difficulties women face during menstruation while gradually working towards the long-term outcome of gender equality. It is vital to recognise that the model proposed for Mayukwayukwa can also be implemented in other regions around Africa in which traditions surrounding menstruation are similar.

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1. Lessons Learned

The main continuing challenge our group faced was striking a balance between wanting to change a deeply held cultural taboo of the community of Mayukwayukwa regarding menstruation, and wanting to respect their traditions and beliefs. Over the course of 12 weeks, our group has come to the realisation that to eliminate what we believe to be a damaging taboo is easier said than done. The publically and privately held cultural belief that menstruation is embarrassing and ritually unclean stems from a long history of misinformation and an aversion to open discussion about the subject. The extent of the damage from the lack of understanding of menstruation is hidden and it has taken us weeks to explore how pervasive it is.

Even in the earliest stages of constructing this proposal, our group had already realised that in order to help this community, we needed to design something more than just a physical product to alleviate the women's troubles. It was vital that we also implemented a long-term educational plan that would enable women to understand the biology of their periods along with the safest, most hygienic way to manage them. In addition to this, we realised that we could further empower the women by giving them the tools and skills needed to manufacture their own menstrual hygiene products and distribute them amongst the community. When women are educated, they are confident in driving development in their communities. Without the support

they need in the form of menstrual pads, facilities such as toilets, and biological education -- they do not live to their full potential.

Furthermore, our group has learned the crucial distinction between short term priorities and long term goals. We entered the challenge hoping to establish absolute, long-lasting gender equality in Mayukwayukwa with the work in our single report. However, we now know this to be a long-term and large-scale goal that will take years to implement. This way of thinking has come about as a result of feeling greatly enthusiastic, inspired and determined to help our fellow woman. We have learned that it would be entirely impossible for us to single-handedly solve all issues related to menstruation management in Mayukwayukwa in one fell swoop. Instead, we have chosen to work on proposing achievable and practical short-term goals that will whittle away at the larger, long-term issues at hand.

The last lesson that we would like to highlight is that empathy and context is key to understanding. As women who already commonly share personal experience with managing periods and its surrounding taboo, we felt like we had an advantage in understanding the main issues at hand. What was different in our experience was that we did not lack the resources to manage it comfortably, like the women in Mayukwayukwa do. While this was challenging for us to understand, we aimed to replicate their circumstances through our prototype creation and testing process to the best of our ability.

Overall, the EWB Challenge in Mayukwayukwa was an outstanding opportunity for us all in Team H.E.R. to explore sustainable development fully and apply it in a real world context. As a team, we were all like-minded in our push towards achieving female empowerment, social change and poverty alleviation in underprivileged communities and we hope this drive is reflected in our proposal.

1. 1. Introduction

1.1.1. Design Brief

Engineers Without Borders (EWB) has partnered with the United Nations Refugee Agency (UNHCR) in Zambia to launch the 2016–17 EWB Challenge. The Challenge this focuses on the Mayukwayukwa refugee settlement in the Kaoma District of Zambia’s Western Province. One of the oldest refugee camps in Africa, Mayukwayukwa is home to over 11,000 refugees, the majority of whom have fled the Angolan War of Independence from 1961 to 1974. The remaining refugees in the community hail from the Democratic Republic of Congo, Burundi and Rwanda.

Our team is working in the design brief area of Water, Sanitation and Health (WASH) in Mayukwayukwa, focusing particularly on women’s health and menstrual hygiene management (MHM). MHM is an umbrella term for the steps that girls and women take to deal with their menstrual cycles and feminine hygiene. These steps include but are not limited to preventing

menstrual flow from staining clothing, maintaining hygiene to avoid infection, eating well, exercising and maintaining daily lives without anxiety.

This report follows **EWB's Design Brief 2.4: *Using local materials for Women's menstruation products.*** EWB have deemed the current method of Menstrual Hygiene Management (MHM) in Mayukwayukwa as unsustainable and expensive. Our role is to design a low-cost, sustainable and reusable and hygienic menstruation products from local materials. This report presents multiple options for a physical menstrual pad product together with a social educational plan.

1.1.2 It's A Cycle...Period

Menstruation is a biological process for women and girls that begins during puberty and continues until menopause. The menstrual cycle lasts for approximately 28 days and begins with an egg being released into a woman's uterus. The body's tissues and blood start to line the walls of the uterus in preparation for fertilization. If the egg fails to be fertilized, the lining is shed through the vagina along with blood. This discharge lasts approximately 2-7 days and is referred to as Menstruation ('Menses' and a 'Menstrual Period' are also common names). The rate and volume of flow not only varies between women but also within the period itself, with the first two days causing the heaviest flow for most girls. In the first few years of the menstrual cycle, menses is often irregular (SPLASH, 2015).

Estimate of Need

The average woman is estimated to have approximately 32 reproductive years (Gupta 2014). Therefore, assuming that eleven sanitary napkins are used per cycle with approximately thirteen menstrual cycles occurring in a year, it can be concluded that the average woman requires 4,500 pads from the onset of their period to the point of menopause (Vostral, 2008).

In developing nations, a reusable solution is the most logical way to eliminate mass wastage and enable women who live in extreme poverty to afford sanitary products. To ensure economic, environmental and social sustainability in development, the solution would optimally adopt a community-based manufacturing approach and the use of local materials.

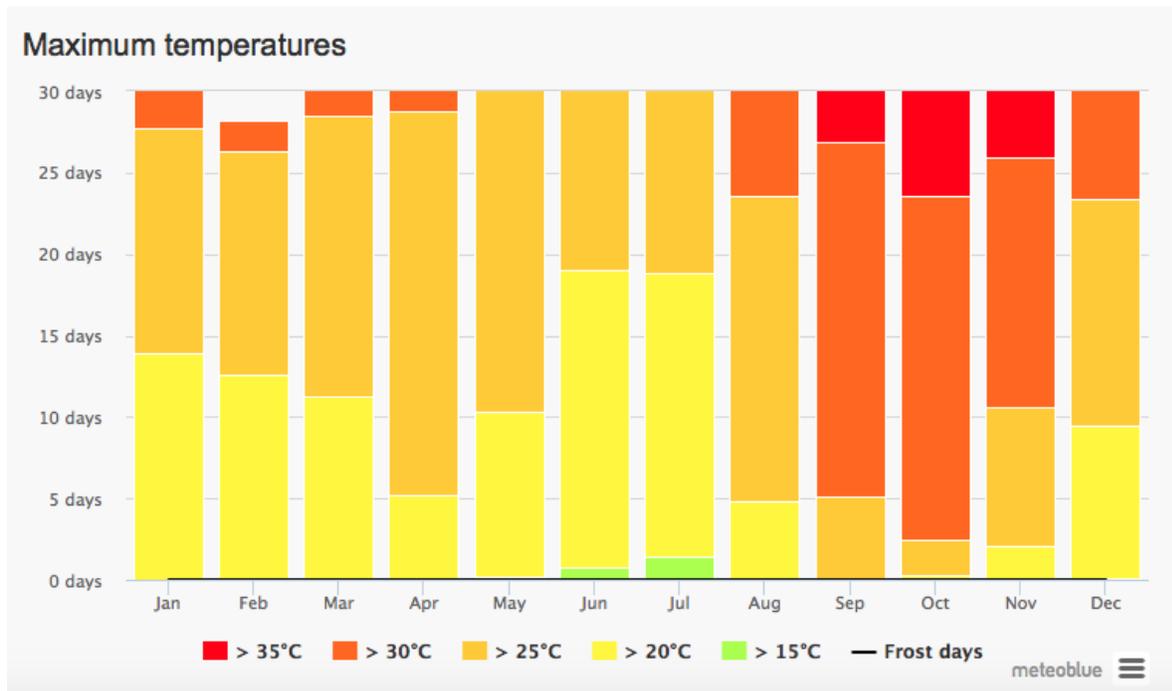
1.2. Context

The refugee settlement of Mayukwayukwa is located in Zambia's Western Province in the Kaoma district. Established in 1966, it is one of the oldest refugee settlements in Africa and is managed by the Government of Zambia, UNHCR and other partner NGO's (UNHCR, 2015).

1.2.1. Climate and Environment

Climate

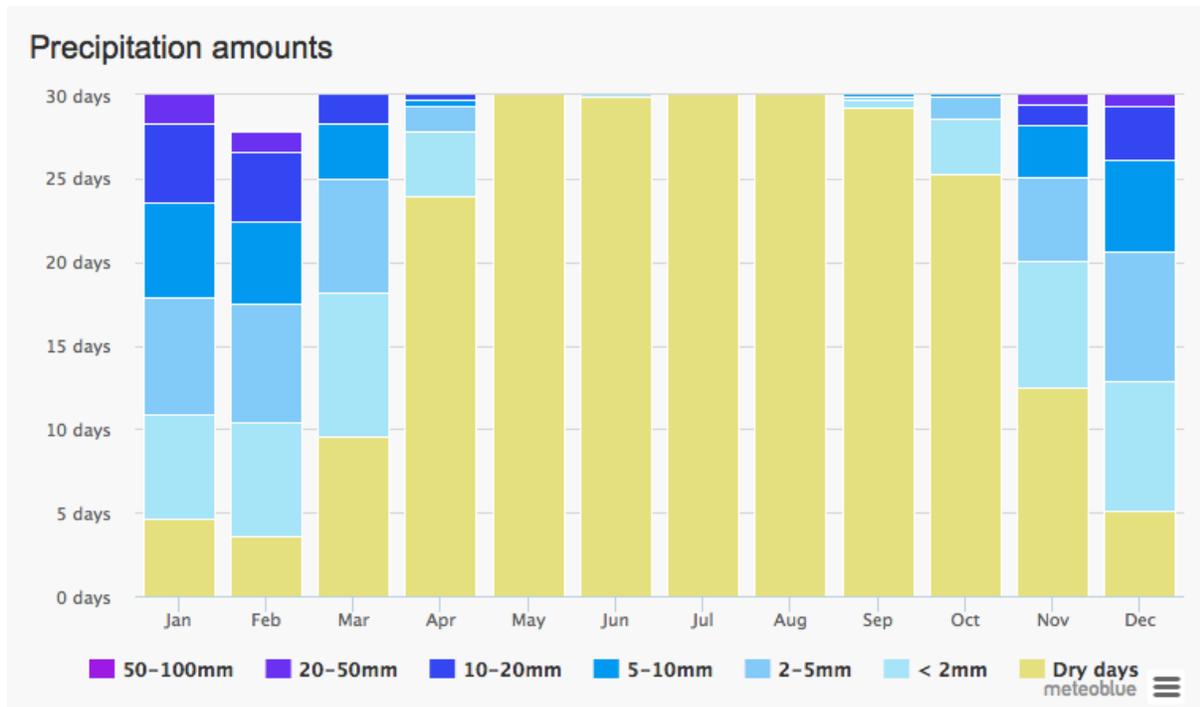
Located 3,871 feet above sea level, temperatures in Mayukwayukwa range between 5°C and 33°C ("Explore Mayukwayukwa Rapids, western, Zambia (rapids). These temperatures are illustrated in the following diagram:



(Figure 1: Diagram depicting maximum temperatures in Kaoma, Zambia: MeteoBlue, 2006)

Dry Spells

The community is located in a drier part of the area with mid-season dry spells occurring commonly (EWB, 2016). The diagram below illustrates the dry season in Kaoma which occurs from April through to October each year:



(Figure 2: Diagram depicting precipitation amounts in Kaoma, Zambia: MeteoBlue, 2006)

Based on the information in the figure above, it is clear that a substantial portion of the year (April-October) is completely dry with no rainfall. While the extended dry season can be beneficial to speeding up drying times of reusable cloth pads, it also has many negative implications for the community including the inability to grow crops and the lack of fresh food and water.

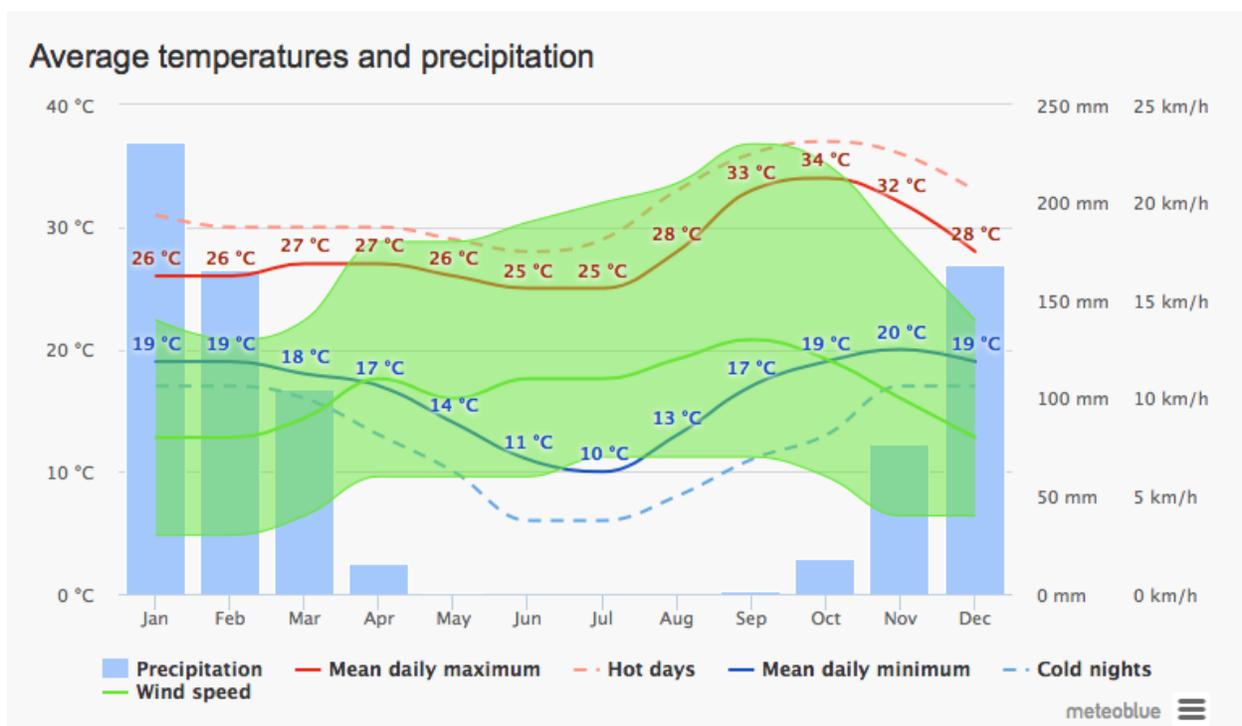
Water Scarcity

The lack of rainwater means that water scarcity is a massive issue for the community. The only source of safe water is in the form of boreholes that are manually operated. The retrieval of this water is typically carried out by women and children and is extremely labour intensive. It is

important to note that water scarcity in the community will impact the ability of the women in the community to thoroughly wash sanitary pads.

Low Wind Speeds

In addition, Mayukwayukwa sees calm winds under 20km/h occurring throughout the year (see Figure 3 below). The low circulation of air as a result of these calm winds will have implications on the drying time of damp cloth materials such as reusable cloth sanitary pads.



(Figure 3: Diagram depicting precipitation, temperature and wind speed in Kaoma, Zambia)

1.2.2. Economy

Mayukwayukwa is mainly a rural settlement with 90% of the district's population relying on agriculture and farming as their predominant source of income (Demographic Health Survey

2014). The people living in the community do not currently have sufficient vocational training and have limited livelihood opportunities, making them rely on donor contributions and the UNHCR solely to survive. This method is unsustainable and locks them into a cycle of poverty.

1.2.3. Demographics & Social Context

The total population of the Mayukwayukwa settlement is over 11,000. Over 6,000 are refugees from Angola while the rest are from Democratic Republic of Congo, Burundi and Rwanda (UNHCR 2015). Approximately 47% of the population are women. Furthermore, it is estimated that 60.2% of females are between 0-19 years old (Demographic Health Survey 2014). It is also important to note that the local integration precinct in Mayukwayukwa will also house Zambian locals.

In the African cultures present in Mayukwayukwa, men traditionally hold most of the power. In recent years, there has been a focus on gaining rights for women but it is widely reported to be difficult to change traditional beliefs. Women's groups across the country have been set up by various organisations to work together in sewing or skills based learning. An example of this in Mayukwayukwa is the Caritas program, a skills-based training group that is funded by the UNHCR and the Czech Development Agency (more information on this program can be located on page 83).

In the village setting, a woman's day generally involves sweeping and cleaning, the collection of water, often from long distances, the washing of clothes, preparation of meals and taking care of children. The main domestic structure in most African families is the 'extended family' model which includes different generations of a family living under one roof (Culture of Zambia 2016).

1.2.4. Cultural Attitudes Towards Menstruation

Mayukwayukwa is home to many refugees who hold different beliefs, rituals and traditions related to the topic of menstruation. All of these African traditions regard a woman's monthly cycle and period as a highly taboo subject. Because of this taboo, both women and men are disinclined to discuss menstruation in public settings, or even at home. This leaves both children and adults susceptible to a vicious cycle of misinformation and myths regarding the subject. Alongside this, many girls/ women do not possess any knowledge about the underlying cause of menstruation, as cultural taboos prevent open discussion. This proves to be a huge underlying issue, as women cannot manage menstruation effectively without having a basic understanding on the natural cycle and the mechanisms behind it. The following sections document specific attitudes in each of the different cultures present in Mayukwayukwa.

Zambian Culture

	Knowledge/Beliefs	Practices
Schoolgirls	<ul style="list-style-type: none"> • Lack of knowledge about why menstruation occurs • Menstruation is a secret • Girls should not “play with boys” when they get their menstrual cycle 	<ul style="list-style-type: none"> • Restrictions on cooking and participating in some activities • Observations of traditional ceremonies and customs • Some ask and elder woman for help
Parents/CHPs	<ul style="list-style-type: none"> • Traditions should continue (girls learn, parents are more aware) vs. they should stop (religious beliefs, times change) • Menstruation is a secret 	<ul style="list-style-type: none"> • There are traditional foods and medicines provided to girls during their first menstrual cycle
Teachers/SHN Coordinators	<ul style="list-style-type: none"> • Menstruation is a secret, but we should talk about it 	<ul style="list-style-type: none"> • Some girls do not feel comfortable asking a teacher for help

Figure 4 is an extract from a report compiled by World Vision Zambia, a partner organisation of the UNHCR in Mayukwayukwa. It summarises key points collected from interviews with schoolgirls, parents and teachers in their various projects around the country about attitudes towards Menstruation. One participant of the study described, “I was scared when it first happened because I had never heard of it before” while another was recorded to have said, “I don’t know why it [menstruation] occurs.”

Figure 4: Summary table of interviews conducted by World Vision Zambia concerning attitudes towards menstruation in Zambia

There is, therefore, a clear lack of knowledge surrounding menstruation, linked closely with the idea that menstruation is a “secret” that no one is supposed to talk about, a point that is echoed in all three demographics consistently.

This report also outlines that Zambian beliefs place restrictions on women during their monthly cycle. Interviewees from the World Vision Zambia study have stated that they “miss out on the

cooking” or avoid holding babies as it will “make them dirty” (World Vision Zambia 2015). The report concluded that the main beliefs related to restrictions on women’s daily activities were common in all communities surveyed. However, the reasons behind the traditions were not known.

Burundian Culture

A UNHCR interview with a 15 year old girl, Marie, who had fled from Burundi to escape political unrest, offers an insight into the cultural attitudes towards menstruation. She describes how “When I got my period, I was offered no explanation. No one told me what to wear or how to cope with the bleeding.” From this, it is clear that menstruation is very much a taboo subject in the Burundian context.

Another young girl said that she has not told her mother about her period in case she “laughs” at her. Another common belief is that taking a bath near any kind of utensils or cookery should be prohibited as drops of menstrual blood could kill family members. The organisation Plan-International, found that many girls are told to stay away from men during menstruation, due to fear that men will ‘see it in their face’. Similarly, they recorded one girl describing how she was told to ‘place blood on her breasts to stop them from falling’ (Plan-international 2016).

Rwandan Culture

A similar spreading of misinformation occurs in Rwanda due to the taboo surrounding menstruation. Periods are generally never talked about, even in a girl’s own home. A Rwandan

teacher, named Bridget Munkanyandwi, states that some girls “ask teachers to see a doctor because they do not know what is happening when they first get their period” (Sullivan, 2014). Action Aid, a UK based NGO that works in Rwanda, states that young girls are told that they “can’t do certain things in their daily life when they have their period”. These include “using salt in cooking or milking animals”. They are also exposed to myths suggesting that they “can’t get pregnant if they have sex while they have their period” (Action Aid, 2016).

Congolese Culture

Rural women in the Democratic Republic of Congo (DRC) are often embarrassed to educate their daughters on menstruation (Valerie, 2014). As is the case with the other African cultures we have explored, this results in young girls not understanding the change occurring in their own bodies. In DRC, menstruation is referred to as *ngonde*, which is also the word for moon (Walker, 1996). This indicates that the idea of a ‘cycle’ is inherently known, although the exact mechanisms or reasons behind menstruation may not.

Angolan Culture

There are no up to date and publically available sources relating to attitudes towards Menstruation in Angola (“WASH in Schools”, 2016). However, due to its close proximity to Zambia, it is fair to assume that similar attitudes and taboos surround the concept of menstruation.

1.3. Problem Definition

The issue surrounding MHM in Mayukwayukwa goes beyond a lack of feminine hygiene products. The cultural taboos present in the area and lack of education about menstrual hygiene are of similar, if not more, concern. As a result, the issue at hand can be divided into the following four sections:



Figure 5: Branches of the issue surrounding menstruation in Mayukwayukwa

1. Lack of Inexpensive, Absorbent and Sustainable Feminine Hygiene Product

“Most of us came in the clothes we are wearing. Crossing borders to flee a country is prohibited, so if we came with more clothes it would have raised suspicions. That’s why many of us only have one pair of knickers and no sanitary pads.”

– Euphraise, a 46 year old Burundian refugee

UNHCR is currently supporting women in Mayukwayukwa by providing two 2x2m chitenges per woman, a bar of soap, and additional underwear. The chitenges are cut into strips and used to catch menstrual flow before being washed and reused. Unfortunately, this method of handing out chitenges 'now and then' is not economically sustainable (Stoakley, 2016). The absorbency and retention levels of the chitenges are not optimal (IDIN, 2016) and EWB has deemed the material as 'quite costly'. There is no predictable schedule as to when these are given out and to how many women. Many women in Mayukwayukwa are forced to go without the UNHCR provided chitenges for certain periods as a result.

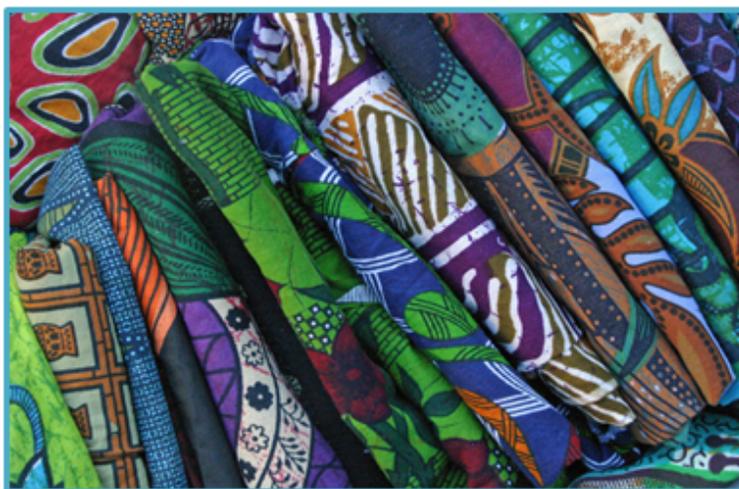


Figure 6: Chitenges are used for many purposes in Zambia and are available in a wide variety of colourful prints.

Without products for menstruation management such as chitenges or sanitary pads, women are afraid to be active and leave the house due to the risk of leakage. Similarly, many young girls miss school for at least 3-5 days each month during menstruation (UNICEF, 2014). As a result of these problems, girls can lose up to 12 weeks of school each year. This has a detrimental impact on their overall education. In fact, a large proportion of girls in rural Africa drop out of school due to restrictions placed on them as a result of their period (Biriwasha, 2008). Unable to finish school, young girls cannot access higher education and thereby alleviate themselves from poverty-stricken situations. As a result, their children will also suffer in the same way. The problem surrounding MHM is, thereby, causing women in Mayukwayukwa to fall into a disempowering cycle of dependence.

2. Inability to change cloths or transport used products to and from school/work

A lack of facilities in schools in Mayukwayukwa (EWB, 2016), indicates that the changing of used pads in private at places outside of the home is almost impossible. This, therefore, also stops girls from going to school as they cannot manage their periods outside of home. One young girl, who was interviewed by UNICEF Zambia stated: *“I hate menstruation because I have to miss school during those days and I love my school....I can't change and dispose menstrual waste which is why my mother always makes me stay home.”* (UNICEF, 2014) It is evident from this statement that, poor MHM creates a cycle of disempowerment and lack of education for women in the community.

3. Privacy for drying cloths

Women are unable to dry their sanitary cloths out in the open due to embarrassment (caused by the cultural taboos surrounding menstruation). They instead store them in discrete spaces, such as under their mattress, in order to maintain privacy. Such spaces are exposed to limited sunlight or air and, as a result, materials cannot dry fully. Women are forced to re-use damp cloth- a breeding ground for diseases. Because of the unhygienic nature of these materials, women experience rashes, sores and bruising and are at risk of infections which lead to many health issues that are otherwise preventable.

4. Cultural taboos and a lack of education about menstruation

As outlined previously, the cultural taboos present in the community prevent open discussion of the subject. This leads to the perpetuation of inaccurate myths about menstruation that cause women to live in fear of it. As a result, many women are stopped from performing everyday tasks during menstruation. This contributes to gender inequality and the disempowerment of women. Furthermore, many girls within the society are unaware of the process of menstruation as a result of a lack of early education. Women cannot manage menstruation effectively without knowing the natural cycle, the mechanisms and reason for their monthly period.

Design Focus

Although the problem at hand is clearly multi-faceted, our team has determined that **Issue 1** and **Issue 4** must be improved first and foremost, and is therefore of primary concern . Thus, this report focuses on evaluating design options for a physical feminine hygiene product, as well as the implementation of an educational program. The two designs will work hand in hand to achieve our ultimate goal: to design a viable and sustainable solution that will suit the needs of these women as well as the community they live in for both the short and long term. This main plan will be complemented by a proposal for a 'Pad Bag' and 'Girl's Hut', which support the improvement of the remaining issues (2 and 3) surrounding MHM. If successfully implemented, this solution will continue to support, not only present, but also future generations of women in Mayukwayukwa.

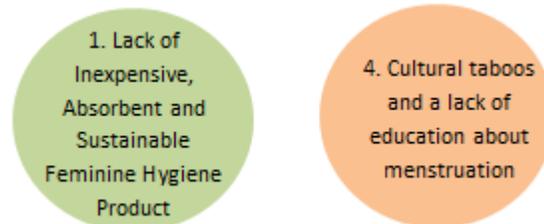
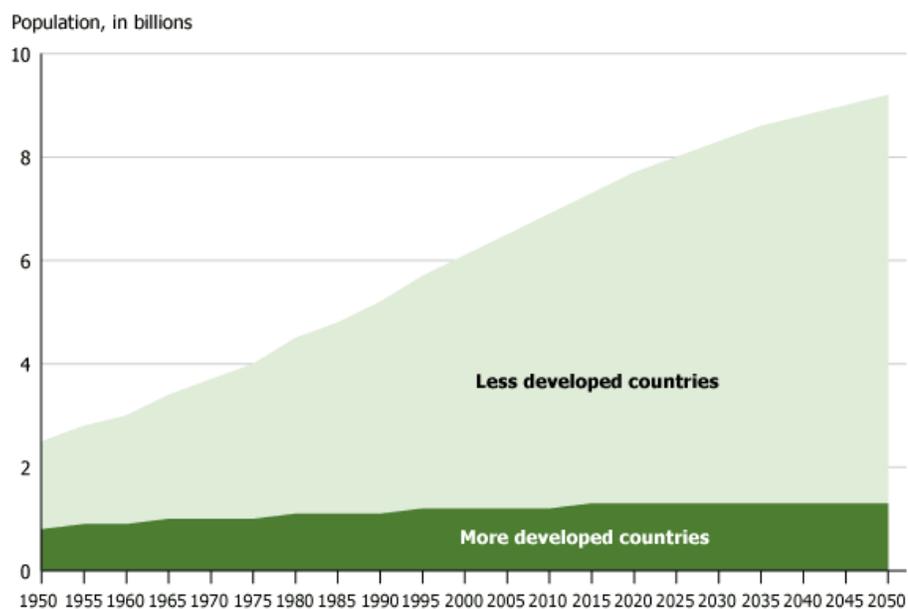


Figure 7: Focus Areas of H.E.R. Proposal

1.4. Our Role

The world's human population is exponentially growing and is expected to reach over 9 billion by 2050 ("Human Population: Population Growth", 2016). As demonstrated in the figure below, between 2005 and 2030, it is predicted that the annual population growth will primarily occur in less developed countries

World Population Growth, 1950–2050



Source: United Nations Population Division, *World Population Prospects, The 2008 Revision*.

Figure 8: Graph comparing world population growth in less developed and more developed countries as predicted for 2050

Following this drastic increase in population, the availability of renewable resources like food and water will be threatened. Professor John Guillebaud, from University College London, believes that the amount of resources required to sustain our population already exceeds what is currently available ("There are not enough resources to support the world's population", 2016). However, through both individual and united action employing certain measures and management, the protection and continuation of the planet's resources is attainable. This is where humanitarian engineers, the role we took upon during this project, becomes essential.

Sustainable Development is a highly contested term. According to the Brundtland Report definition, it refers to development that meets the needs of the present without compromising the ability of future generations to meet their own needs ("Sustainable Development | IISD", 2016). It is essential that we, as engineers, achieve a design that is viable and ensures long-term prosperity in the community. Communities such as Mayukwayukwa are also economically disadvantaged and consequently, possess limited livelihood opportunities. Thus, it is important for us to act towards implementing sustainable measures within these communities. Our job is to provide a system, which will assist to improve the overall quality of life within the community and sustain it for future generations to come.

To ensure the durability and integration of our design into the community, the emphasis on empathy is essential. Historically, the concept of empathy arose from the German idea of *Einfühlung*, which translates to 'feeling into,' presented by the philosopher Robert Vischer ("*Einfühlung and Empathy*", 2016). Empathy allows us to gain greater insight into the complex interactions of varying systems, considering environmental, economic and socio-cultural aspects. Mayukwayukwa's culture is extremely diverse, as refugees bring many different beliefs, cultures, traditions and practices to the community. Thus, it is essential for the designing process to be culturally sensitive. Empathic skills are necessary to gain insight into alternative perspectives allowing us to develop a holistic and critical understanding of the socio-technical challenges.

Only then, with this comprehension, can steps be taken to combine scientific understanding, analysis and creative thinking towards meeting the needs of the society.

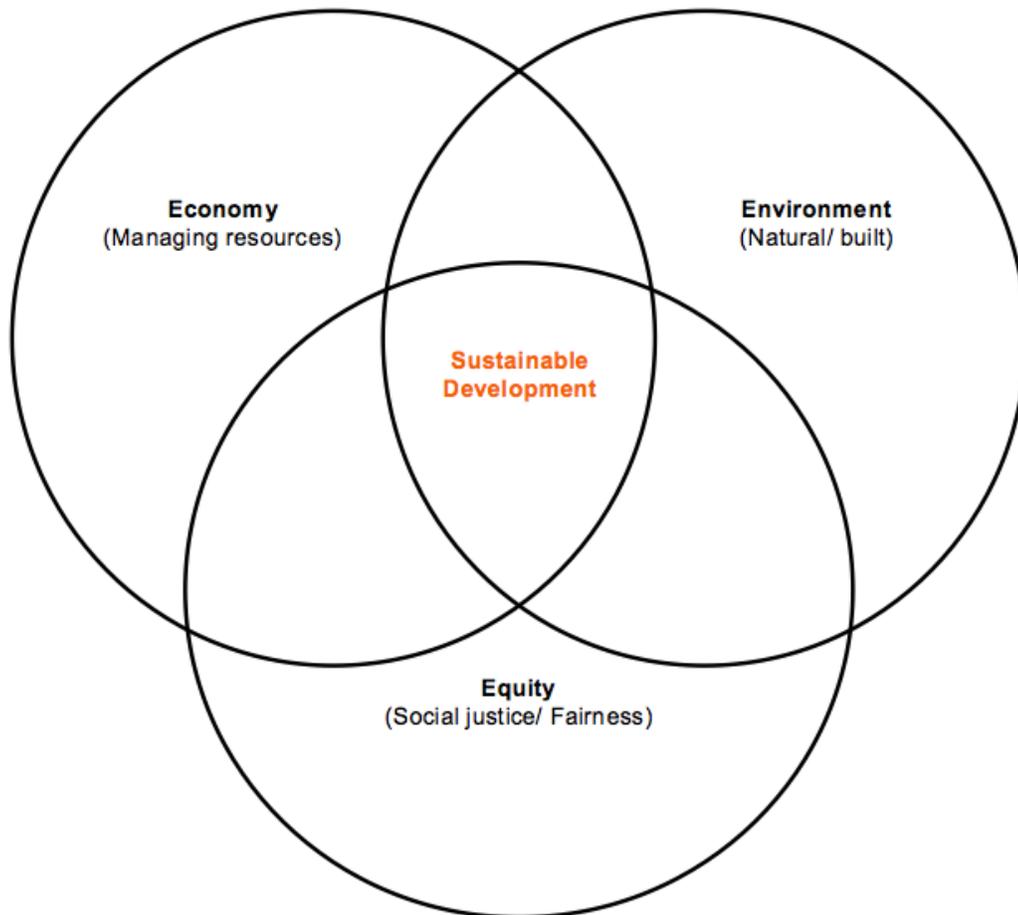


Figure 9: How the economy, the environment and equity overlap to make the foundations for sustainable development

1.5. Design Requirements in Context

1.6.1. Socio-Cultural

The most critical factor to the acceptance of any new system or product in Mayukwayukwa is the community's engagement and cultural acceptance of the implemented design option.

Aspects to consider in our design proposal include:

- Respect towards the existing traditions and beliefs the community holds with regards to menstrual practices and womanhood
- Community engagement in the entire process from manufacturing and distribution of the product to educating others about menstruation
- Empowering women in providing them opportunities for self-sufficiency and business enterprise

1.6.2. Environmental

Management of the local resources must be considered in our design proposal in order for the project to be sustainable in the long term. Materials used in the manufacturing process must be:

- Sourced responsibly - either be recycled, reusable or biodegradable so as to minimise negative impact on the local environment
- Considerate of the climate of the community and designed with maximum efficiency in mind, especially in terms of washing and drying pads

1.6.3. Economic

In order to be successful, the project needs to be viable within the economic means of Mayukwayukwa and the bodies that support it, such as the UNHCR and Engineers Without Borders among others. This means that the project should:

- Make the best use of funds as possible
- Allow for gradual decrease in the community's reliance on outside donors in the long term

2. Proposal Structure

Recognition of the deep complexities of the women's difficulties in Mayukwayukwa has led our team to the realisation that implementing lasting change in the psychology of the community regarding menstruation would be a long-term process. Consequently, our team needed to design a process that would alleviate the current short-term needs of the women while simultaneously tackling large-scale issues such as cultural taboos and gender inequality in the community.

This dual-approach to the proposal will be outlined in this report through addressing the short-term needs of the women with a design option for a physical product in the form of a reusable sanitary pad and a comprehensive educational plan.

2.1. Physical Product

The physical product options presented in this report will be variations of a reusable sanitary pad design. The reusable pad will be a short-term solution for women in the community to manage their periods effectively, hygienically and discreetly.

In order to ensure the adaptability and practicability of the proposed product designs in Mayukwayukwa, the product options will be evaluated according to criteria addressing:

- Cost
- Size
- Materials
- Aesthetic
- Manufacturing
- Health & Hygiene
- Sustainability
- Cultural Appropriateness
- Usability

2.2. Educational Plan

The long-term needs of the community including elimination of menstrual taboo, gender equality and business and livelihood generation will be addressed in this section with various options for an educational plan across the entire community.

The long-term implementation of this educational plan will be done gradually so as to be culturally accepted and sustained in the community. Our aim is for all stakeholders in the community to eventually gain ownership of the project and, thus, eliminate the harmful effects of taboo on women's menstruation.

The viability of the long-term educational plan will be measured across the following criteria:

- Cost
- Community engagement
- Sustainability
- Cultural Appropriateness
- Achievability

The combination of both the physical product and the educational plan is crucial to creating positive change in Mayukwayukwa relating to women's health and menstruation and neither section can be implemented on its own successfully. Design options that adequately address all the aforementioned criteria will have the greatest chance of success in the community.

3. Physical Product

3.1. Design Options

This section outlines three design options for a physical MHM product. The design options are evaluated and critiqued in regards to shape and structural design as the use of specific materials is flexible in all options (for evaluation of materials see section 3.2).

3.1.1. Product Option 1: **Pad Incorporated In Bikini-Style Underwear**

Description

The women of Mayukwayukwa are dependent on UNHCR providing them with underwear and chitenge cloth. This is not a sustainable process, as the women are completely reliant on the provision of these products, which are only occasionally distributed by the UNHCR. Thus, it is important that the women are able to become self-sustaining and this is achievable by designing underwear, which allows a sanitary pad to be held in place, as well as being reusable and inexpensive.

The design includes the use of the highly available chitenge cloth, which is used to make reusable and aesthetic underwear. The underwear is made using a very simplistic design and is adjustable around the waist, making it able to fit a range of differing body types. The underwear also incorporates pockets, which are specifically used to hold a reusable pad in position.

This design allows women to remain active during their period, as it minimises threats of leakage. It also reduces shame and embarrassment with the flattering and pretty cloth used. It is also inexpensive, as it is made from locally sourced materials and is reusable.

Sewing Instructions

1. Two pieces of chitenge cloth are cut following underwear pattern (measurements seen in Figure 13.). The straps can be made as long as necessary for the particular individual.
2. These two pieces are then sewn together at the seams, so that both materials inside are facing outwards. A small area is left unsewn between the two waist straps on the backside of the underwear.
3. This is then turned inside out, utilising the hole left, so that the pattern is seen on the outside and seams are left on the inside.
4. The hole is then stitched up by hand.
5. Two pieces of chitenge cloth are used to make the pockets. Referring to the measurements in Figure 15. These pieces of cloth are hemmed.
6. These pieces of cloth are then sewn onto the underwear, leaving the side facing inwards open.

Diagrams

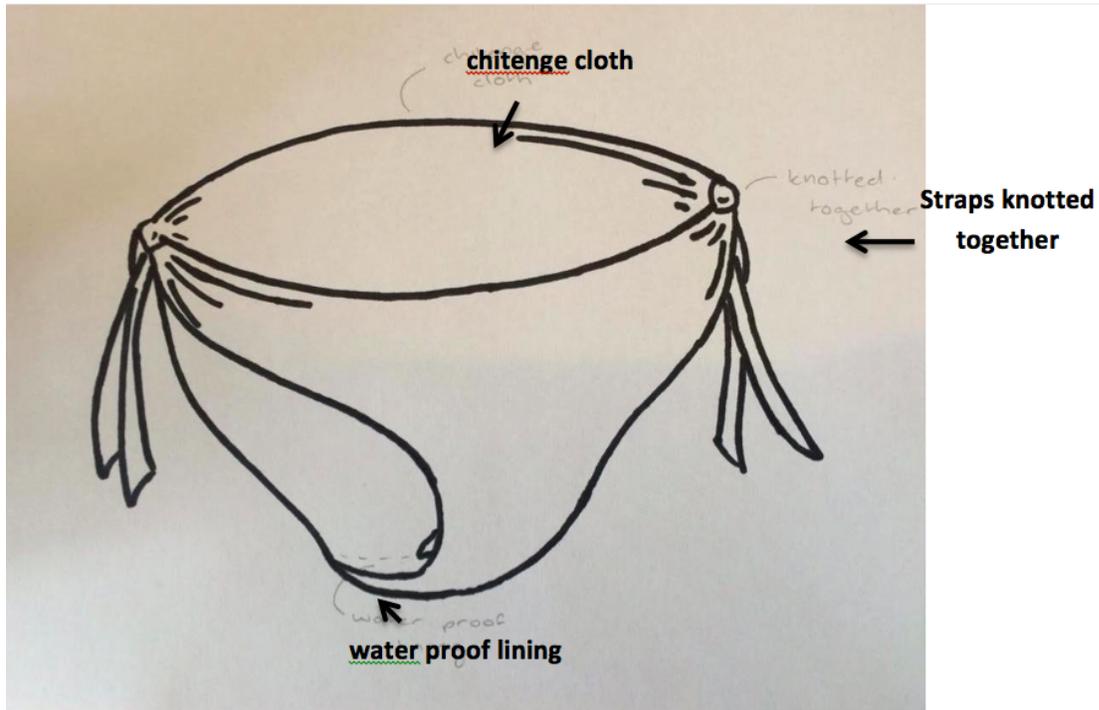


Figure 13: Diagram of chitenge underwear.

The diagram above depicts the bikini-style underwear pad knotted at both sides allowing the underwear to be adjustable to fit a range of body types.

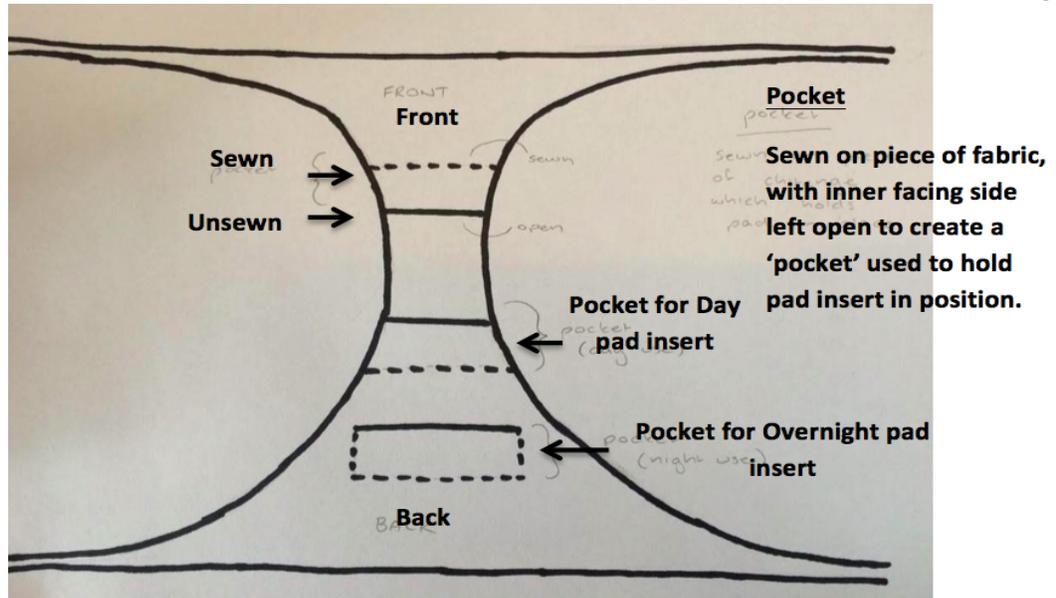


Figure 14 (above): Diagram of underwear, outlining the pad pocket

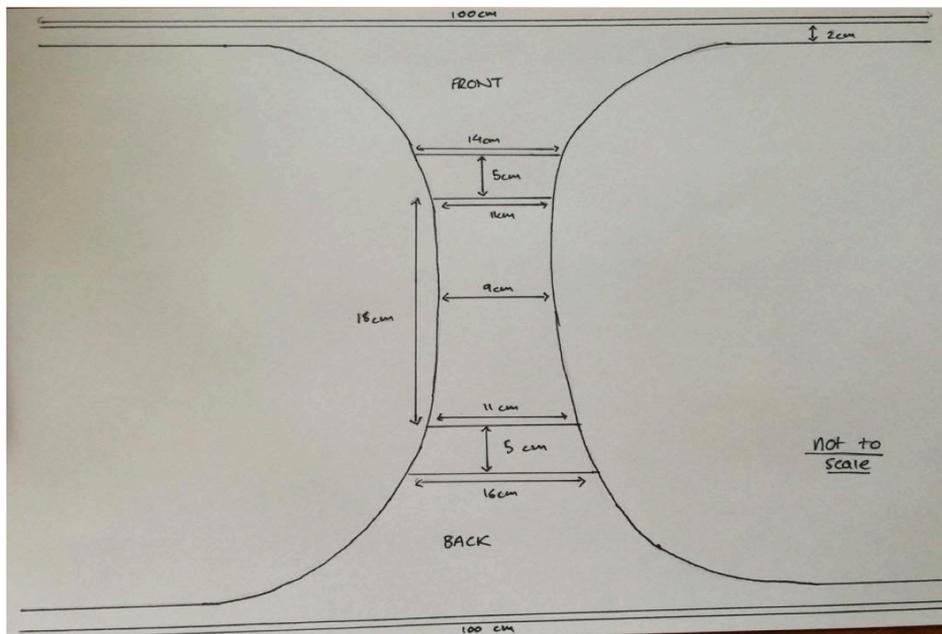


Figure 15 (Above): Diagram of underwear with measurements

Prototypes



Figure 16: Image of underwear tied at sides

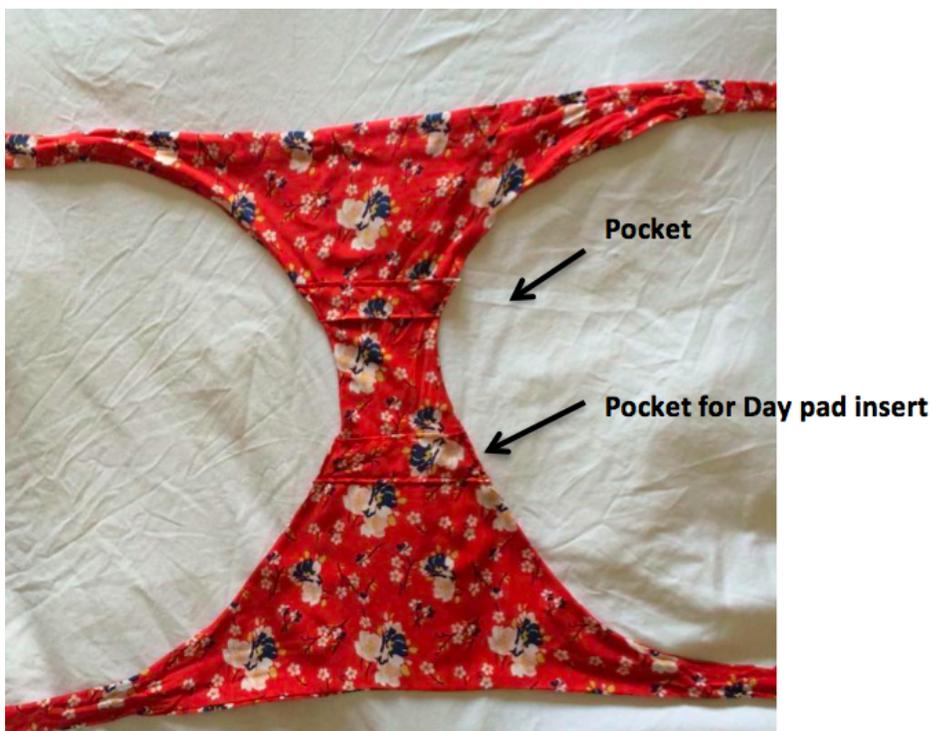


Figure 17: Image of inside of underwear, where pad is held in place by pockets.



Figure 18: Close-up image of pockets, which hold pad(s) in place.



Layers of
mutton cloth



Figure 19: Image of pad insert prototype.

Evaluation

Costs

- The chitenge cloth can vary in price. The cheapest (2m x 1m) in Kaoma costs about 20 ZMK (AUD \$2.67 or USD \$2.05) to 30 ZMK (AUD \$4.00 or USD \$3.07). The higher quality chitenges cost around 40 ZMK (AUD \$5.33 or USD \$4.09).
- Sewing machines used within the program Caritas CR, so come at no cost.
- Overall, the design would cost somewhere between 20 ZMK – 40 ZMK (not including the price of thread or price of pad insert).
- This design is relatively affordable, when the cost of the fabric is compared to the Mayukwayukwa residents average spending costs. Those who are poverty stricken spend approximately 20-100 ZMK per month. Those who have a stable source of income spend above 150-200 ZMK per month.

(Source: XE Currency Converter: ZMK/USD & ZMK/AUD)

Size

- Approximately 2m x 1m of chitenge fabric is needed. However this does vary, dependant on the individual.

Materials

- Chitenge cloth
- Cotton thread
- Pad insert (to be made up of most effective available material, see section 3.3)
- Sewing Machine
- Scissors
- Pencil

→ Ruler

Aesthetic

The aesthetic revolves around the primary use of the chitenge cloth. This material comes in a large range of traditional colours and patterns, which can be utilised to make the underwear to look aesthetically pleasing. This material is also widely used within the community, so is seen as a culturally appropriate material to use. The use of the colourful and vibrant material could also assist to build women's confidence during their menstrual cycle whilst lowering feelings of shame and embarrassment.

Manufacturing

The production of the underwear would occur through programs such as Caritas CR which provides access for refugees in Mayukwayukwa to receive apprentice training (such as tailoring). They are funded by UNHCR and Czech Development Agency.

Health and Hygiene

Women's overall health and hygiene would be immensely improved through the implementation of this design. Women's mental health will be improved, as women are able to continue their everyday activities during their menstrual cycle. Women would also attain a greater understanding of their menstruation, also improving how they manage their cycle and their overall health. This would occur through the use of instructional images and the set-up of women groups within the community, to educate women on the health and hygiene surrounding the use of the underwear and insert-able pads. Keeping the products hygienic themselves is also very simple. The underwear and pads are to be washed in cold water and left out in the sun to dry. The sun acts as a natural antibacterial.

Sustainability

- The underwear and sanitary pads are reusable.
- Inexpensive.
- Locally sourced materials.
- Can be manufactured easily by locals.
- Could be used to make a profitable business within the community, provide income to residents (economically sustainable).

Cultural Appropriateness

The main issue surrounding women's menstrual cycles in Mayukwayukwa is the taboo and embarrassment that is associated with it. This leads women to dry their sanitary items discreetly in ways that mean the products do not receive any sunlight, which acts as a natural antibacterial disinfectant. The underwear design combats this issue by firstly being made from the culturally accepted and popular chitenge cloth. The underwear also looks like underwear the women are used to seeing and/or using. The pockets, which hold the pad inserts in place, are discreet and hardly noticeable. The use of bright, colourful and patterned material also helps mask stains. Thus, the underwear can be hung up to dry without the stress that people will assume its for menstrual purposes. In addition, the insertable pads will come with a hessian bag further enabling them to be dried discreetly in the sun.

Usability

- Easily adjusted to fit different body types with the adjustable straps.
- Provides women with underwear, which they may not have had access to previously.
- Reusable.
- Underwear holds pads in place, which prevents unwanted leakage.

3.1.2. Product Option 2: **Belted Pad**

Description

The current method of MHM in Mayukwayukwa involves women being dependent on UNHCR to provide them with underwear in which to hold the 'sanitary napkin' (chitenge cloth). A design which does not require underwear would support the ultimate goal of making the community completely self-sufficient.

The Belted Pad, is a self-held sanitary product. The design consists of an adjustable belt, which loops through a piece of fabric that runs between the legs. This fabric securely holds a sanitary pad in place, with the use of a pocket, within which it is placed (refer to figures 10, 11 and 12 for a visual representation of this design).

This design is based on the classic Hoosier Ladies' Sanitary Belt of the 20th century which featured a thick washable pad attached to a belt-like harness that was worn by women around the waist (Museum of Menstruation and Women's Health, 2004).

Diagrams

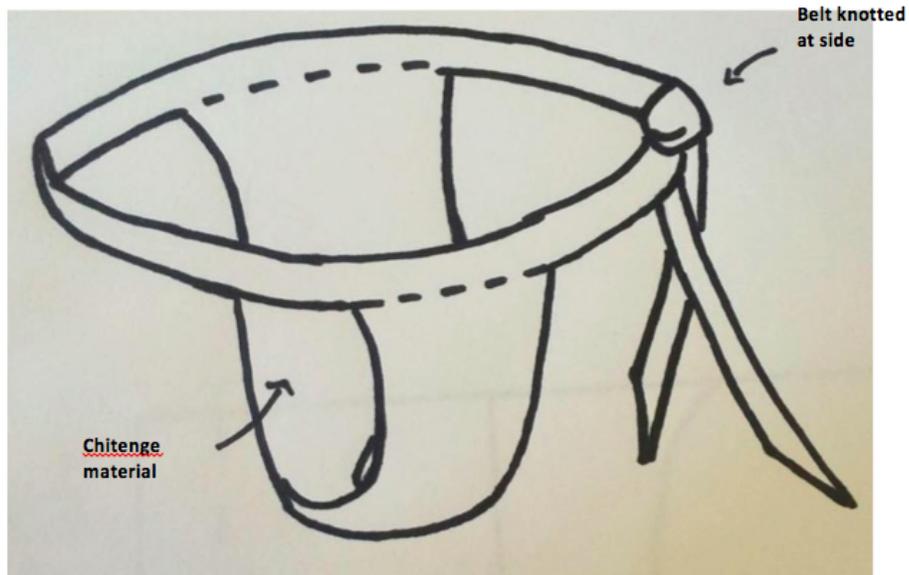


Figure 10: Diagram of Belted Underwear tied at sides

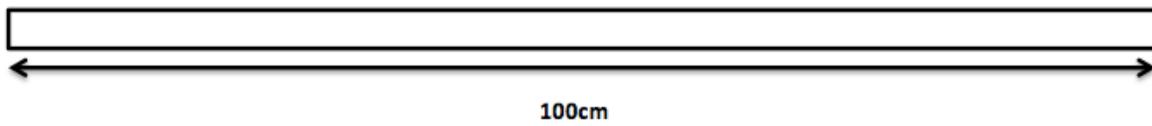


Figure 11: Diagram of Belt

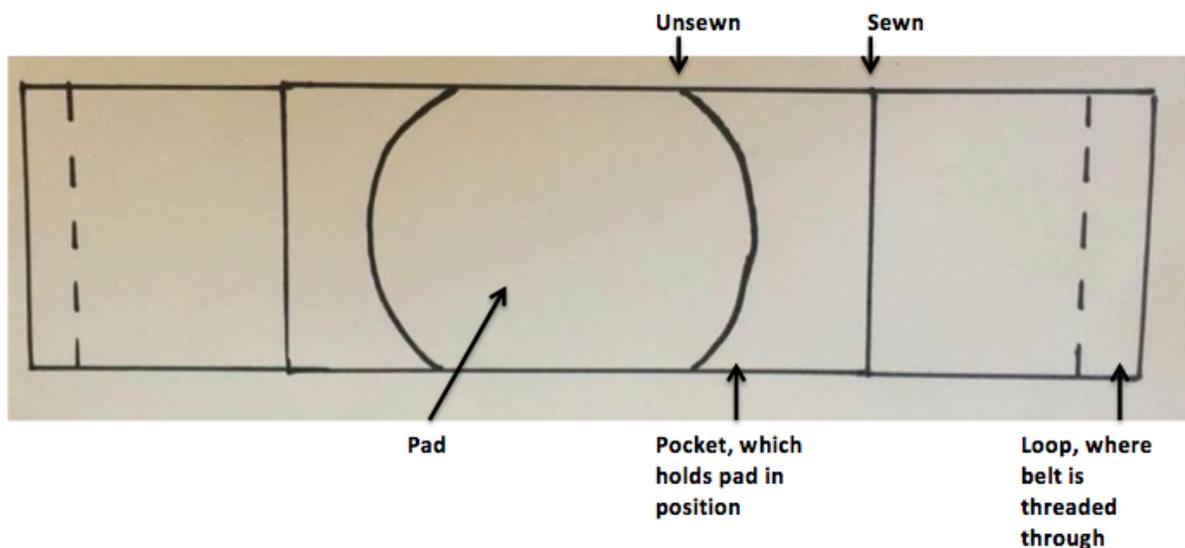


Figure 12: Diagram of pad within belt

Evaluation

Cost

- Chitenge material for belt ranges from 20-40 ZMK
- Cost for removable pad inserts will vary depending on materials chosen

Size

Pad

- Different lengths for different ages/heaviness of period (Regular – 7cm x 20cm & Long [heavy/night] – 12 x 32cm)

- Flexibility and adjustability in pad thickness due to multiple thin-layer format assures comfort and adaptability for a range of period flows (heavy VS light)

Belt

- Regular band/belt – approximately 60 cm for girls and 90cm for women that can be tied securely according to individual waist size
- Belt made of same material as chitenge which is cheap and easy to source

Pad Pocket

- Fabric in the form of cotton chitenge material is required for the pocket for the pad
- Pocket can fit multiple pads depending how heavy the period is

Materials

- Chitenge cloth
- Cotton thread
- Pad insert (to be made up of most effective available material, see section 3.3)
- Sewing Machine
- Scissors
- Pencil
- Ruler or measuring tape

Aesthetic

The belted pad is made with chitenge material (which is already used by women) to make women feel comfortable wearing the design. The belt is adjustable around the waist and one can tie it to fit best on their bodies.

Manufacturing

Sewing machines are available to the community of Mayukwayukwa through the Caritas Czech Republic program (see page 83 for more information). The use of sewing machines in manufacturing the pads is quicker and more efficient than hand-sewing. Furthermore, using existing facilities does not incur high transport costs for the goods manufactured and local production means that women in the settlement can get involved with the process. The materials used for the pad such as bamboo fleece, terry cloth, cotton and mutton cloth are also readily available in the region.

Health & Hygiene

- Keeping the products hygienic themselves is simple. The underwear and pads are washed in cold water and left out in the sun to dry. The sun acts as a natural antibacterial.

Sustainability

- The belted pad is made of ethically sourced materials that are reusable, therefore the environmental harm associated with plastic disposal can be avoided
- Belted pads can be used for multiple years and hopefully enable girls to attend and finish school even while experiencing their periods

Cultural Appropriateness

- The concept of the belted pads builds on and improves the current practices of the women in the community which involves wearing reusable cloths, therefore should be easily accepted into the culture of Mayukwayukwa.

Usability

- Easily adjusted to fit different body types with the adjustable straps.
- Provides women with underwear, which they may not have had access to previously.
- Reusable.
- Underwear holds pads in place, which prevents unwanted leakage.

3.1.3. Product Option 3: **Attachable Winged Pad**

Description

The 'Winged Cloth Pad' attaches to a woman's underwear and absorbs menstrual flow, and thereby acts as a solution to *Area 1* of the problem surrounding MHM in Mayukwayukwa. This product can be split into two separate designs; a winged cloth pad with a removable insert and a one piece cloth pad. Both designs have been successfully implemented by NGO's and local organisation in other communities in Zambia and neighbouring countries. Both involve the same basic shape with buttoned wings which attach onto underwear.

The inspirations for the winged pad design option were derived from existing pad companies *Afripads* and *Ecofemme*.

Afripads, a social enterprise from Masaka, Uganda, provides menstrual kits to over 750,000 women and girls across Africa. The kits contain four reusable cloth pads that are ultra-absorbent and a storage bag that can be used to transport used pads. All the materials used in manufacturing these kits are sustainably sourced and are easily washed and dried (*Afripads* citation).



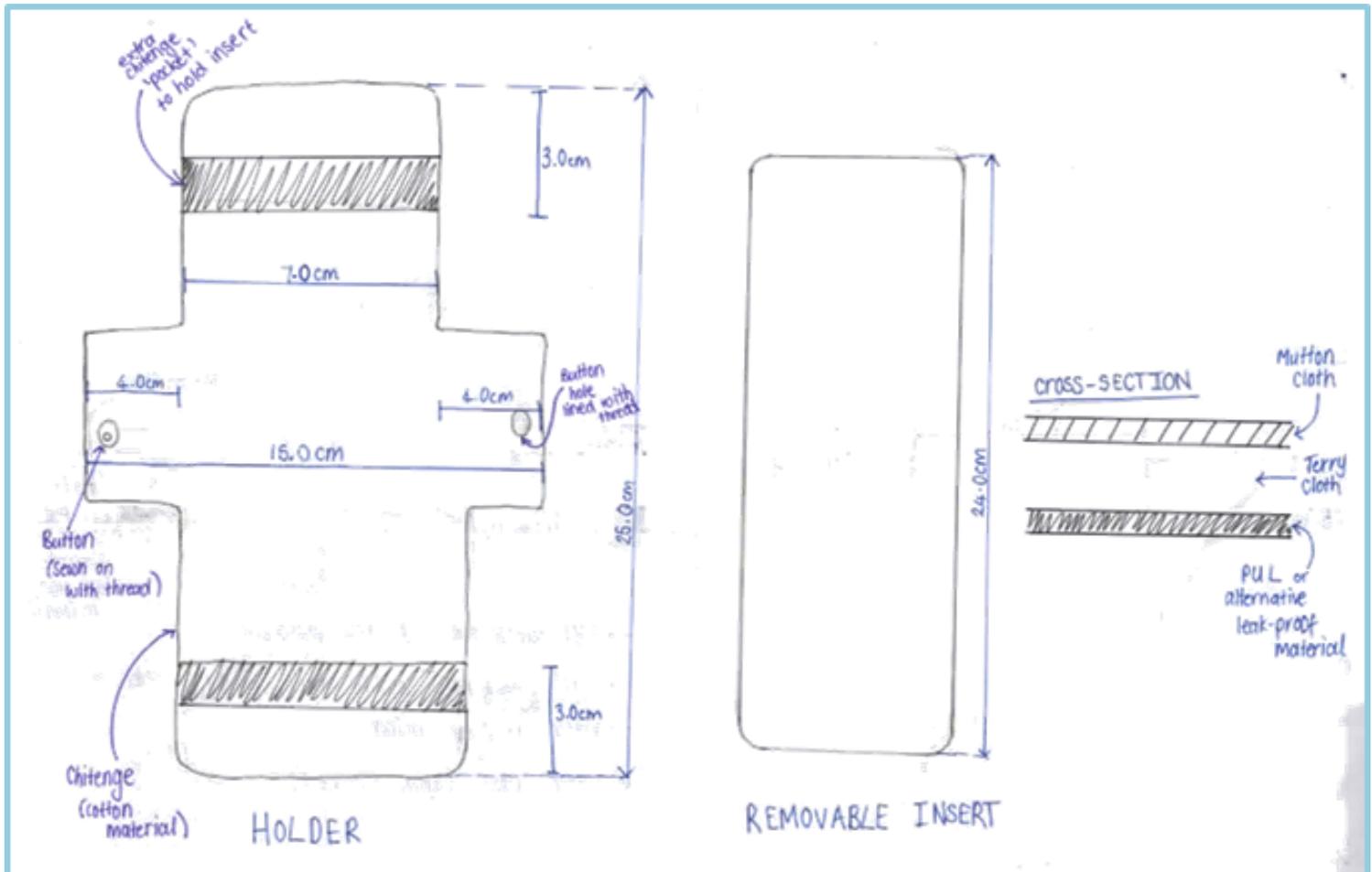
Figure 20: Afripads Menstrual kits contain four reusable cloth pads and a storage bag

Ecofemme is a women-led social enterprise based out of Tamil Nadu, India. The company produces reusable cloth pads that are sold to women and girls all across the globe, with a 1-for-1 pad deal in which, for every purchase, the same number of cloth pads and menstrual health education is provided for girls for free in Tamil Nadu, India. The cloth pads by *ecofemme* feature an all-in-one design with 5 cotton flannel layers and a breathable PUL leakproof barrier and soft cotton flannel top. The pads are attached onto underwear with metal press studs and can be washed and dried quickly and easily (Ecofemme citation).



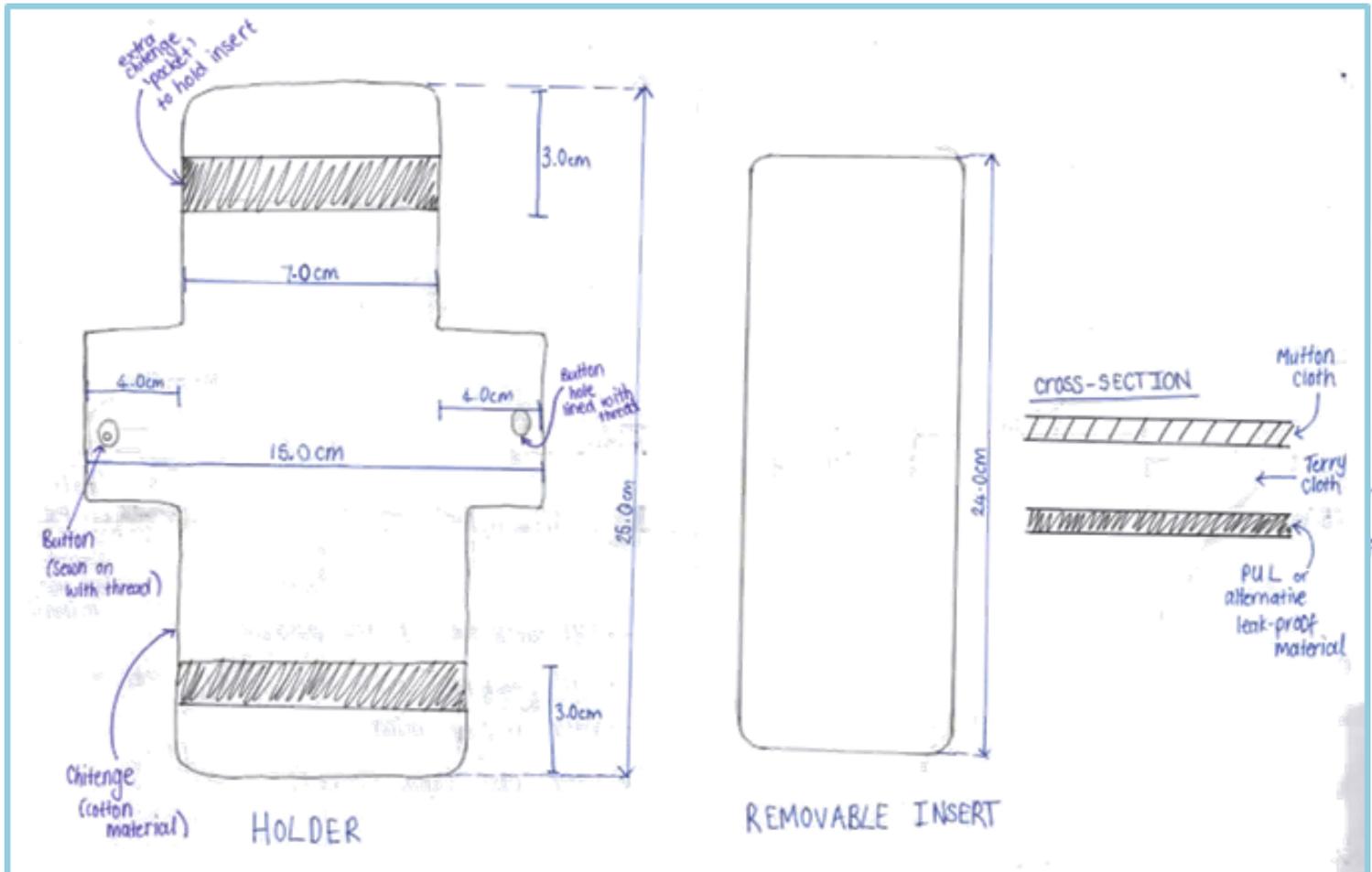
Figure 21: Ecofemme pad in open & buttoned up configuration as inspiration for Design 3.2

Diagrams



Design 3.1- Removable insert

Figure 22: Diagram depicting design and dimensions of Design 3.1 (Winged Pad with Removable Insert)



Design 3.2 – One Piece

Figure 23: Diagram depicting design and dimensions of Design 3.2 (One-Piece Sewn Winged Pad)

Evaluation

The positives (in black) and negatives (in blue) of the two designs are evaluated below with respect to the design criteria:

Cost

3.1 Removable Insert

- The exact cost varies depending on manufacturer and materials. The cheapest Chitenge (2m x 1m) in Kaoma costs about 20 ZMK whereas the higher quality chitenges cost around 40 ZMK.
- Only 1 base will need to be manufactured for every 4 Removable inserts (less costly).
- One standard removable insert size (less costly than different thicknesses for one piece)
- **Water proof layer addition:** PUL lining is the most effective waterproof lining and is used in most projects around the world. The issue is that it has to be imported from large city centres or from overseas (this is expensive).

3.2 One Piece

- Exact cost varies. The chitenge fabric used for the base can vary in price. The cheapest (2m x 1m) in Kaoma costs about 20 ZMK whereas the higher quality chitenges cost around 40 ZMK.
- Multiple designs need to be made for different levels of flow (more costly).
- **Water proof layer addition:** PUL lining has to be imported from large city centres or from overseas (this is expensive).

Size

3.1 Removable Insert

- Removable insert: 6 x 24 cm
- Holder: 8 x 25 cm
- The thickness of the inserts will vary depending on required absorbency level (heavy flow vs. normal flow)
- Multiple pads inserted into pockets for heavy period flow.
- The removable inserts allows the design to be folded in a compact manner

3.2 One Piece

- 8 x 25 cm
- Thickness of the pad will vary depending on required absorbency level (heavy flow vs. normal flow).
- Flexible materials allow pad to be compactly folded

Materials

3.1 Removable Insert

- Soft and comfortable lining -Mutton cloth
- Terry cloth
- Chitenges/cotton holder & pockets
- Cotton string (thread)
- Buttons
- All of these are produced and bought locally. They are taken from sustainable deposits.
- Again, we face a problem with the waterproof lining as PUL needs to be sourced from urban areas. No suitable alternative for waterproofing could be found locally, although there is the possibility of upcycling plastic (this would require a factory based processing and cannot be relied on with the current resources).

3.2 One Piece

- Soft and comfortable lining - Mutton Cloth
- Terry cloth
- Chitenge/cotton lining
- Cotton string (thread)
- Buttons
- All of these are produced locally and are taken from sustainable deposits)
- Similarly, the sourcing Polyurethane Laminate (PUL) is an issue.

Aesthetics

3.1 Removable Insert

- The addition of a patterned cotton outer layer allows the design to be aesthetically pleasing.

3.2 One Piece

- The use of a patterned cotton allows the design to be aesthetically pleasing

Manufacturing

3.1 Removable Insert

- Only 1 base will need to be manufactured for every 4 Removable inserts.
- Can be made locally - manufacturing workshops can be set up in rural locations (sustainable, long-term economic benefit for community)
- Two separate components need to be manufactured. This is not a major issue but will require multiple patterns

3.2 One Piece

- All in one design
- Less sewing than a multi-component design.
- Can be made locally - Manufacturing workshops would be set up in rural locations (sustainable, long-term economic benefit for community).
- More chitenge used

Health and Hygiene

3.1 Removable Insert

- The product needs to be kept hygienic by washing the pad in cold water with soap prior to being left out in the sun to dry. Ultraviolet rays naturally kill bacteria.
- The use of this product will improve the mental wellbeing of women as they are empowered to participate in regular activities without the worry of leakages.

3.2 One Piece

- The product is kept hygienic by washing the pad in cold water with soap prior to being left out in the sun to dry. Ultraviolet rays naturally kill bacteria.
- The use of this product will improve the mental wellbeing of women as they are empowered to participate in regular activities without the worry of leakages.
- Harder to dry: more chance of being less hygienic.

Sustainability

3.1 Removable Insert

- Produced from local materials that are sustainable sources
- Provides an opportunity for community members to run micro-enterprises and manufacturing businesses, therefore improves the long-term economic success of the community.
- The inserts can be reused for a year, depending on the materials used and manufacturer.
- The addition of a waterproof PUL layer will be more costly but will allow the pad to last longer (more sustainable)

3.2 One Piece

- Produced from local materials that are sustainably sources
- Provides an opportunity for community members to run micro-enterprises and manufacturing businesses, therefore improves the long-term economic success of the community.
- Can be reused for a year, depending on the materials used and the manufacturing quality.
- The addition of a waterproof PUL layer will be more costly but will allow the pad to last longer (more sustainable)

Cultural Appropriateness

3.1 Removable Insert

- The design is modest and discreet. It is not visible externally.
- The mechanisms conform to cultural traditions and views (unlike menstrual cups or tampons).
- Reusability prevents the need for incinerating used pads – an action that is not accepted in Zambian tradition.
- The removable insert can be dried quicker, than a one piece pad (less time out in public).

3.2 One Piece

- The design is modest and discreet. It is not visible externally.
- The mechanisms conform to cultural traditions and views (unlike menstrual cups or tampons).
- Reusability prevents the need for incinerating used pads – an action that is not accepted in Zambian tradition.

- Takes longer to dry (more time out in public which does not sit well with the current taboo nature of the subject).

Usability

3.1 Removable Insert

- It is likely that only the removable insert will need to be washed after every use.
- This makes the product relatively easy to dry as the components can be separated.
- The winged design provides stability and only a minimal risk of leakage.
- This option is flexible/ adaptable to the specific thickness needed for an individual's menstrual flow.
- Parameters such as shape and thickness can be varied depending on the products available and local preference.
- Foldable – easy to store/carry
- Similar designs are already used effectively (*Afripads* in Uganda)
- Needs to be worn with underwear, not a standalone product (assumes underwear is already provided/owned).

3.2 One Piece

- The winged design provides stability and only a minimal risk of leakage.
- Foldable – easy to store/carry
- Parameters such as shape and thickness can be varied depending on the products available and local preference.
- Similar designs are already used effectively in other developing communities (*Ecofemme*)
- Needs to be worn with underwear, not a standalone product (assumes underwear is already provided/owned).
- Compared to the removable insert, this design takes a long time to dry due to its thickness.
- The whole product needs to be washed after every use (more water needed).

By evaluating the 2 designs against the criteria, it is obvious that option 3.2 is more reliable and effective in the refugee context of Mayukwayukwa.

3.2. Materials

A study conducted by the Massachusetts Institute of Technology evaluated the effectiveness of six basic (See: Figure 24) materials as sanitary products in developing nations. These materials are documented to be easily sourced specifically in rural Zambia (Gupta, 2014), allowing sustainable community-based manufacturing to occur. In addition, to these 6 materials, we will also evaluate *Terry Cloth* as a possible option as it is also available in Kaoma (Stoakley, 2016). The requirements for an effective design, including the need to absorb and retain discharge, be in contact with the user without irritating skin, and a high wicking and fluid-retaining interior with a waterproof exterior (Save et al, 2005). In a reusable design for the Mayukwayukwan context, durability (which would influence sustainability and affordability of a final product), and drying time (reduces the impact of issue 3 in figure 5 in section 1.3). Therefore, this section will aim to provide a technically and scientifically sound evaluation of these materials, by judging the following criteria: *Absorption, Retention, Durability, Comfort* and *Drying Time*.

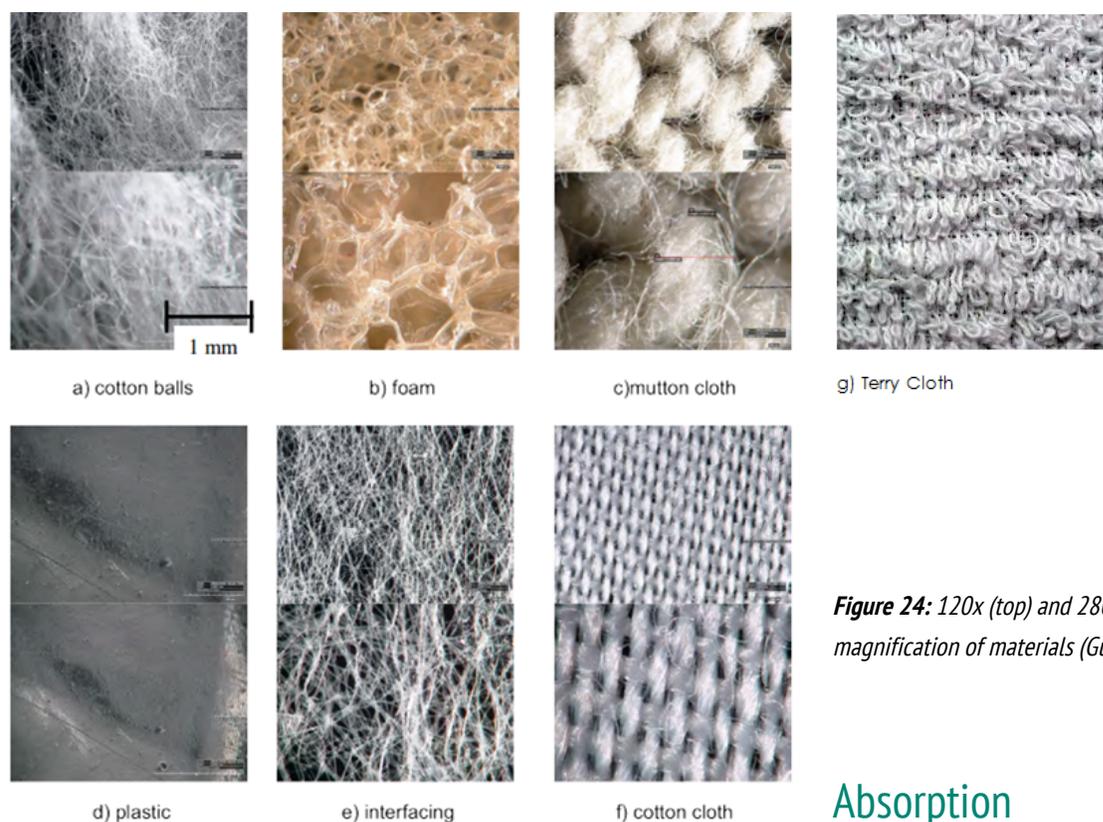


Figure 24: 120x (top) and 280x (bottom) magnification of materials (Gupta, 2014)

Absorption

Method

The absorption is tested in two ways, both using coloured tap water as the liquid. First, a basic pad absorption test is performed in which the ratio of the mass of a fabric saturated with water over the mass of dry fabric is measured:

$$\text{Absorption Value} = \frac{\text{mass}_{\text{saturated}}}{\text{mass}_{\text{dry}}}$$

This is repeated for all fabrics. No wringing of the fabric occurred in this test, the materials were instead “left to hang until the dripping stopped” (Gupta, 2014).

Secondly, 1cm wide samples of the fabric were held in tension, suspended in air with 1cm approximately submerged in the dyed water (as shown in Figure 25). The method involves measuring the progression of water each at intervals of 5 minutes for a duration of 1 hour for each sample. The rate of vertical wicking is used to measure the ability of materials to uptake

liquid. This is a particularly important quality in a top layer of a sanitary pad, so that menstrual discharge will quickly be absorbed away from the user, decreasing initial leakages due to heavy period flow.

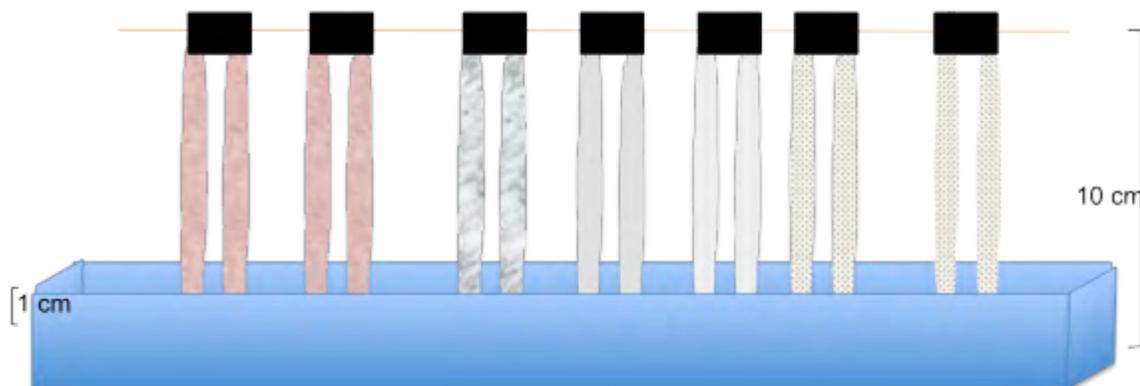


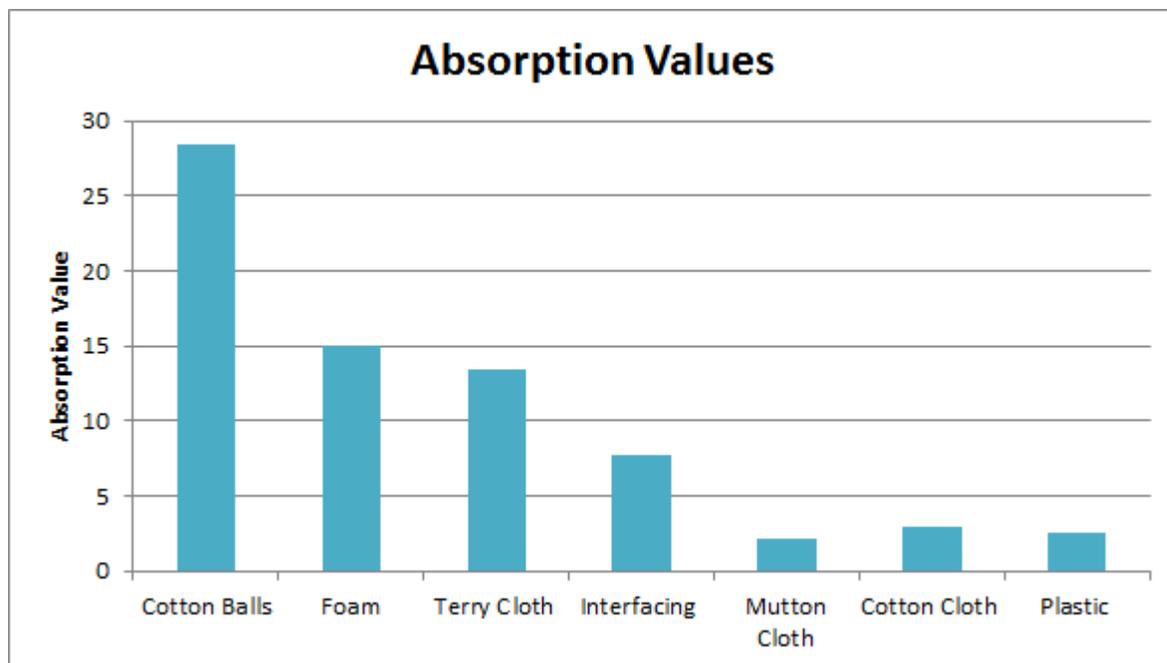
Figure 25: Schematic Diagram of the Wicking Rate Test (Gupta, 2014)

Note: Cotton balls were excluded from the vertical wicking test as it is not compatible with the setup.

Results

Basic Absorption Test:

The absorption values for each material are recorded in Figures 26 as tested by the M.I.T study (Gupta, 2014) combined with our own measurements. Materials absorb from 1.0 to 28.0g of fluid, with cotton balls, foam and terry cloth being able to absorb the most fluid. A table of values can



be found in Appendix A.

Figure 26 - Absorption Values for respective materials

Vertical Wicking Test:

The primary result is that after this amount of time, the cotton cloth, terry cloth and mutton cloth were the only materials to exhibit any vertical wicking. Figure 27 is a graphical representation of these results.

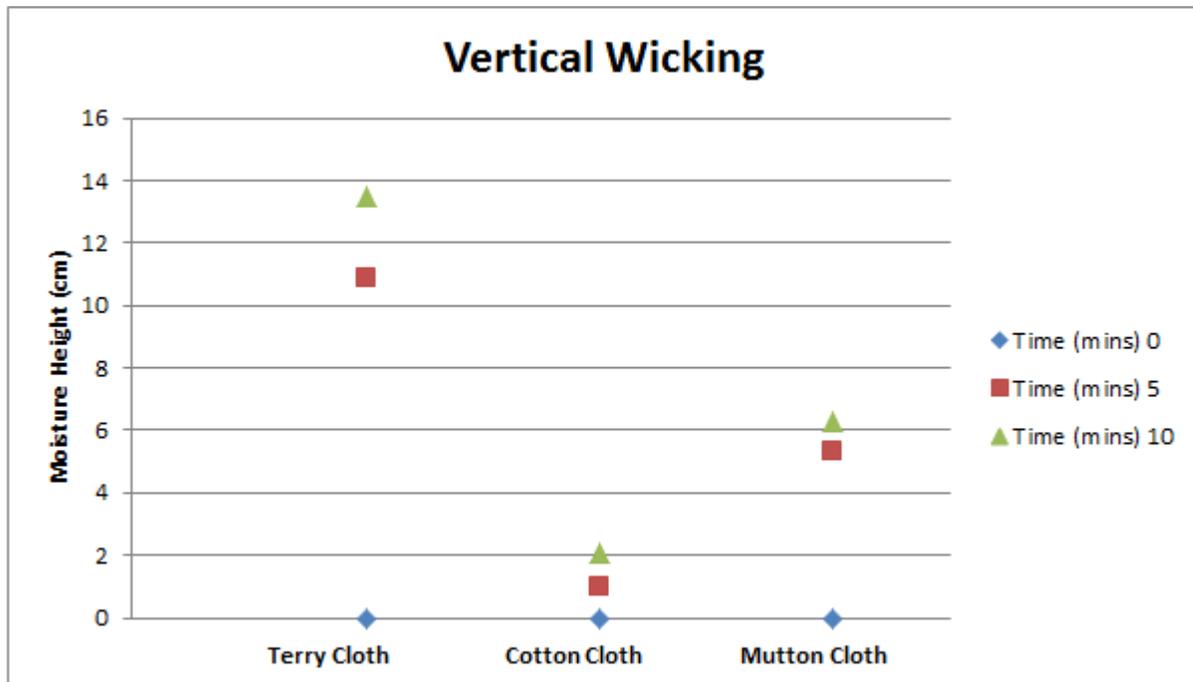


Figure 27: Scatter graph of Vertical Wicking test results.

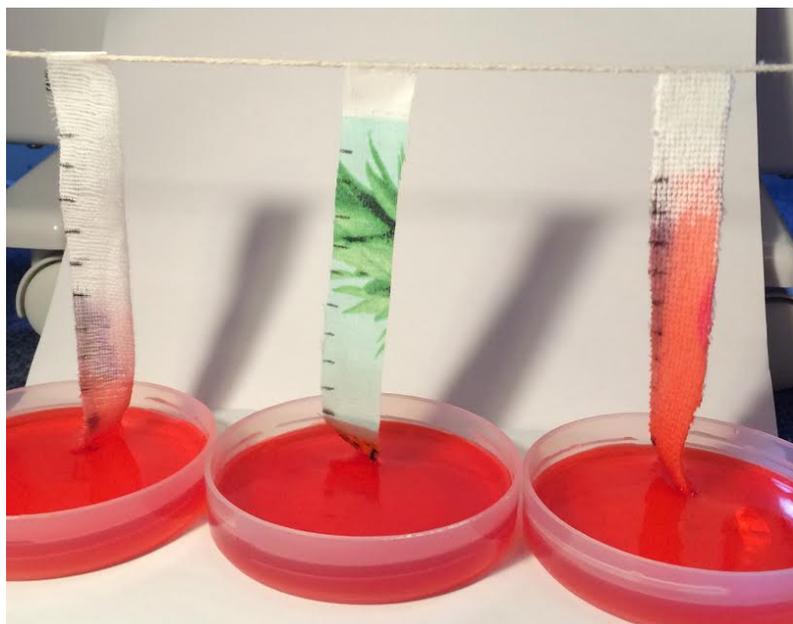


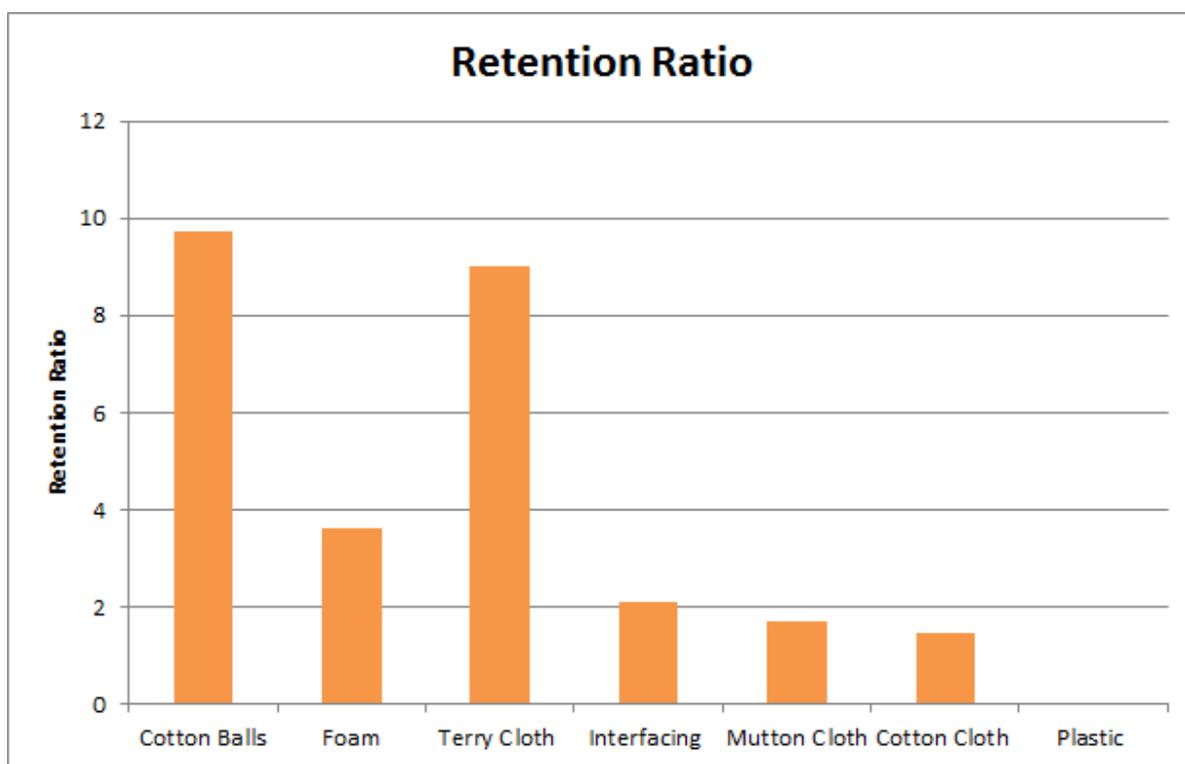
Figure 28: Vertical Wicking levels on Mutton Cloth, Cotton Cloth and Terry cloth respectively after 15 mins.

Retention

Retention values are important to consider as a force will be applied to the sanitary product during use. Retention is measured by taking the ratio of the 'squeezed' (wetted then subjected to a force) sample to that of the dry sample (Gupta, 2014):

$$\text{Retention Ratio} = m_{\text{squeezed}}/m_{\text{dry}}$$

A mass of 16.2 kg (force of 158.8 N) was used to compress and determine a retention ratio for



each fabric. Figure 29 is a graph of the results. A table of results can be found in Appendix B.

Figure 29: Retention Ratios

Softness

The Softness level of each material is best tested through qualitative observation and is important to consider as the material will be worn very close to the users skins. Based on research (Gupta, 2014) and primary testing, our team has ranked the overall softness of the 7 materials as follows.

Softness Ranking (most soft to least soft):

1. Cotton Balls
2. Mutton Cloth
3. Cotton Cloth
4. Terry cloth
5. Interfacing
6. Foam
7. Plastic

Drying time

A fairly rudimentary drying test was conducted by soaking the material in the liquid before wringing it out evenly and constantly such that dripping of the liquid ceases (Gupta, 2014). The sample were then hung indoors at room temperature (approx. 20°C). The time taken each sample to dry (dryness being judged when no moisture was felt) was then recorded. A table of results can be found in Appendix C. Figure 30 graphically represents these drying times.

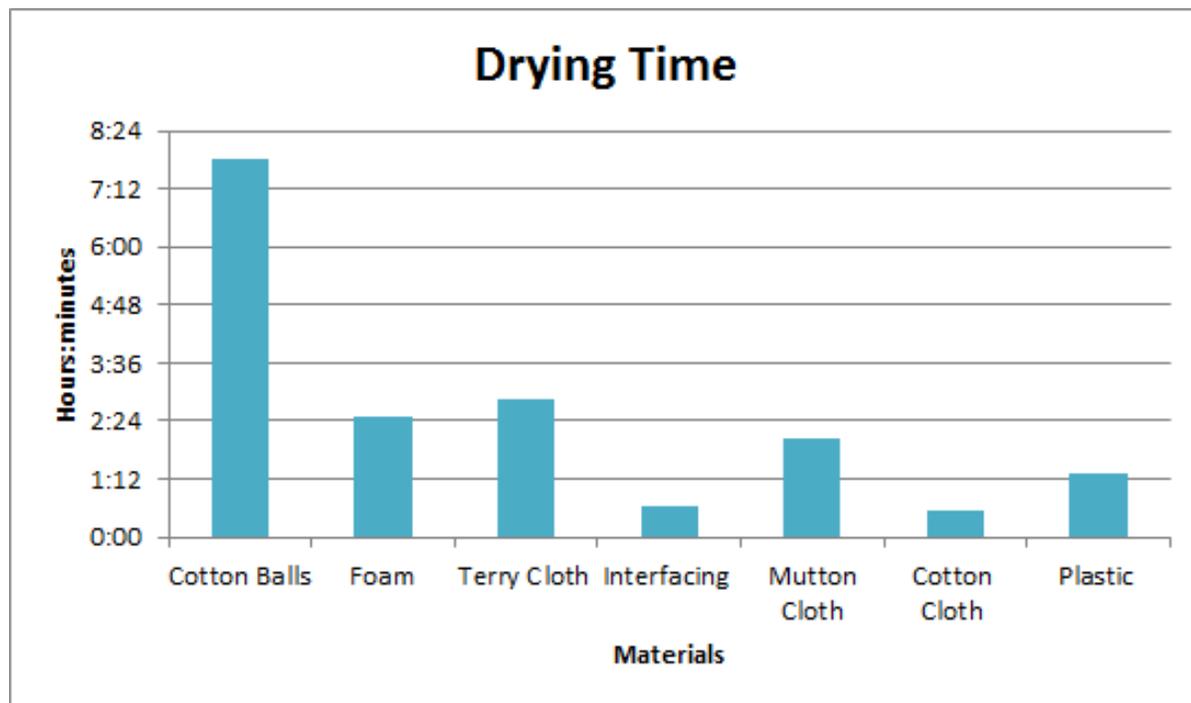


Figure 30: Drying time of materials

Durability

The most realistic method to determining the durability of the material is washing and drying the samples repeatedly and vigorously and documenting structural change. The study of interest imaged 5 of the samples of interest using a Digital Microscope at 160x magnification and the fracturing pattern was observed as follows:

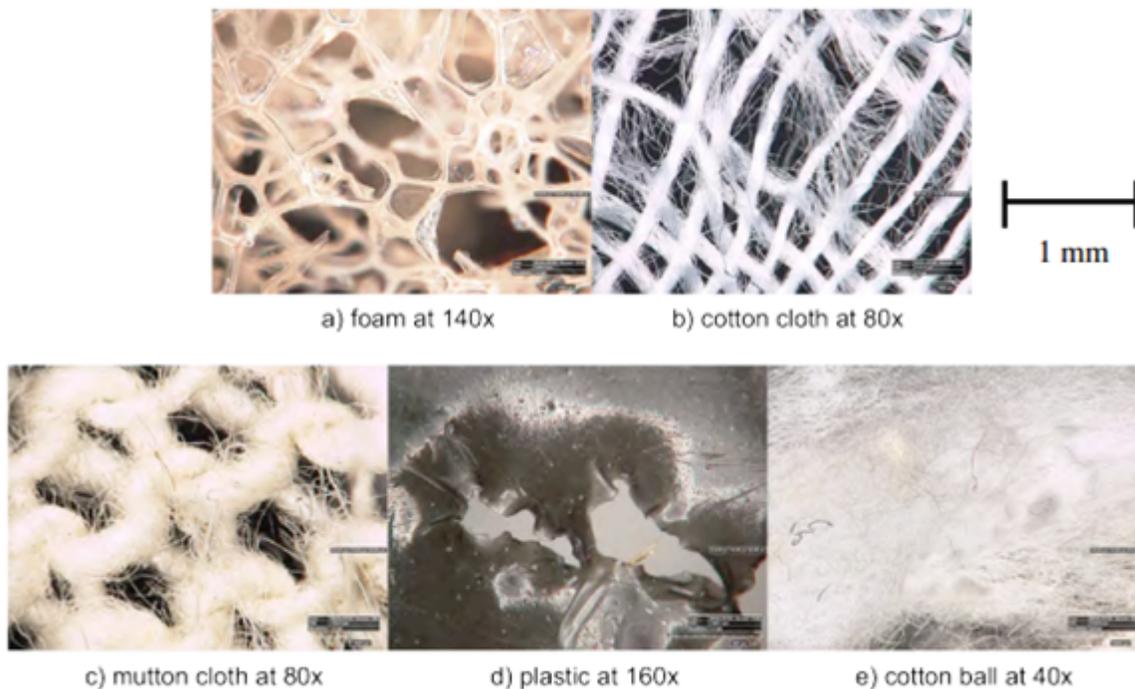


Figure 31: Fracture patterns after vigorous washing and drying

From these images it is fair to conclude that foam, mutton cloth were highly durable while cotton cloth was moderately durable. Cotton ball has a very low durability. The plastic used in this experiment not extremely durable, however, the use of an alternative form such as PUL has will improve durability of the waterproof layer (Anandjiwala, 2014).

Although Terry cloth was not tested experimentally, it is known for its durability and a study conducted a into 'Textiles in Sustainable Development' has shown its effectiveness as a long-lasting material (Anandjiwala, 2014).

Usability

The following issues are foreseen with the use of certain materials:

- Cotton Ball: It is difficult sew this material, and as such is not optimal for usage in sanitary pads/removable inserts.
- Foam: This material is naturally quite thick so will not be comfortable and practical for women to wear while they are active/working.
- Interfacing: No evidence was collected to suggest that this material is available specifically in the Kaoma district.

Experimental Limitations

- Across the tests, consistency in environmental conditions was a constant limitation as the terry cloth test were conducted by our team while the other 6 materials were observed in the M.I.T study (Gupta, 2014).
- Errors were reduced by repeating the experiments of mutton cloth and cotton in our primary tests and ensuring they were similar to that of the published study.
- Wicking rate is dependent on the level of tension in the materials; in this test, they are merely suspended in air
- Vertical Wicking test was stopped after 15 minutes as the line of moisture reached the top of the terry cloth at this time.
- Softness testing is highly subjective, and variances would occur between different samples of materials.
- The drying times only provide a comparison between the different materials. The exact timing will differ in the Mayukwayukwan climate.
- Terry cloth and interface were not examined in the study for durability. Fracture patterns under a microscope are therefore not able to be analysed for these.
- Terry cloth was estimated to be very durable based on secondary research only.
- The vigorous washing and drying were not an exact representation of the conditions the pads would have to withstand over its usage period as other environmental factors would also lead to degradation.

→ Further tests must be conducted to determine the lifetime of each material if they were to be used as a sanitary product.

Evaluation

The data gathered from the tests were considered in order to give the materials a rank out of 5 for each criteria:

	Absorption	Retention	Comfort	Drying Time	Usability & Durability	<u>Total Rank (out of 25)</u>
Cotton Balls	5	5	5	1	1	17
Foam	5	3	2	2	3	15
Terry Cloth	5	5	4	2	5	21
Interfacing	4	3	3	4	3	17
Mutton Cloth	2	2	5	5	2	16
Cotton Cloth	3	2	4	5	5	19
Plastic	1	1	1	5	4	12

Figure 32: Rank out of 5 for each criteria

Although limitations were present in the test methods, well-rounded evidence was gathered for each potential material. It is clear from these tests that the Cotton Balls and Terry Cloth have the highest absorbent and retention levels. However, Cotton Balls are very difficult to sew and as such can be deemed impractical in the context of a sanitary pad. Terry Cloth also ranks high in Comfort and durability and, thus ranks it highest overall. It is therefore the optimal choice for the inner layers of the Sanitary pad. In addition, PUL plastic would be idea for a water resistant lining, however, there is no evidence to suggest that it is available in the Kaoma district and

would most likely need to be imported from bigger cities in Zambia. Chitenge Cloth (cotton cloth) may be used for an extra layer of protection and aesthetic appeal.

Trade-offs

The cost of each material needs to be taken into consideration and will result in some compromises between optimal fabrics. This is explored further in section 3.3.3.

3.3. Final product: A Sanitary Pad for H.E.R

3.3.1. Blueprint

Compromising between factors such as cost, usability and comfort, our final design incorporates aspects of both the Underwear and Belted sanitary pad designs. The design primarily follows the ideas behind the Belted sanitary pad design option. It includes a thin strip of material, which holds the pad(s) in place, utilising a belt to hold it securely around the waist. The strip of material that runs between the legs has two pockets, like that of the Underwear design, where a pad, or multiple layered pads can be held in position.

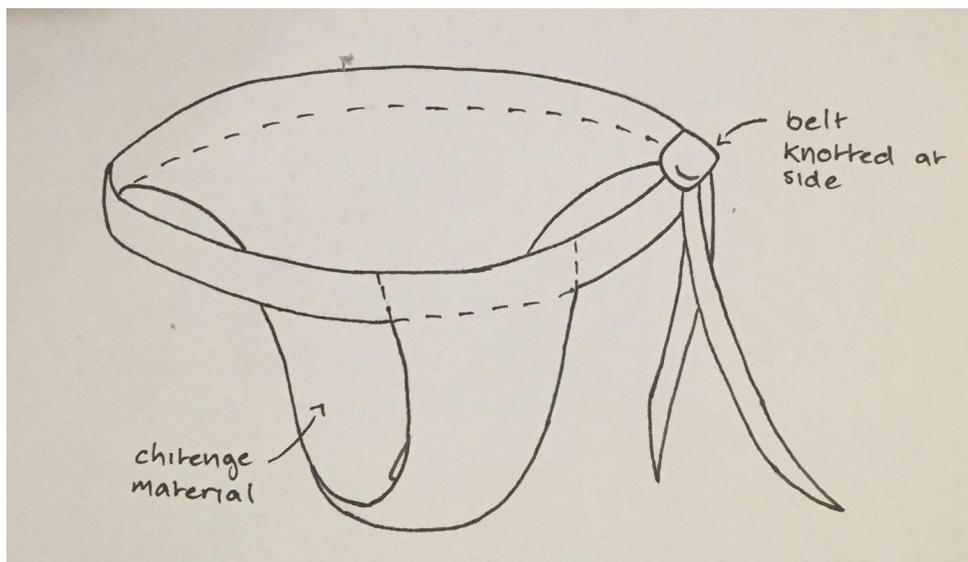


Figure 33: Diagram of the Belted Pad design.

The strip of material is securely held in place by a belt, which threads through loops at the ends, made from the same chitenge material. However, the garment has been altered to provide more comfort to the wearer. The material that runs through the legs is a rectangular shape at the front that expands at the back into a more triangular shape. The back of the garment follows that of the Underwear sanitary pad design, providing a larger amount of material accommodating for a women's physique. This allows the design to be considerably more comfortable, as well as significantly making it more leak-proof.

Figure 34 (below): Diagram depicting design of "A sanitary pad for H.E.R."

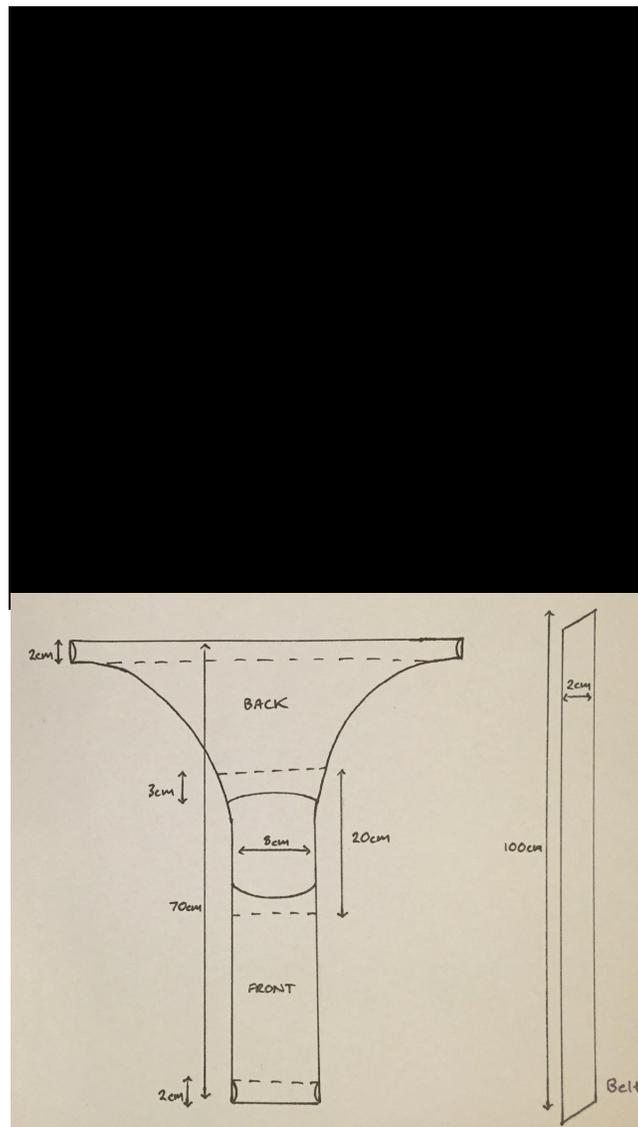


Figure 35 (above): Measurements of the design of "A Sanitary Pad for H.E.R."

Although we found Terry-Towelling to be the most absorbent material as seen in section 3.2 (Materials) of our report, a trade-off had to be made between quality and cost. Terry-Towelling would be the most effective pad material, however, would make our design considerably more expensive. Thus, a compromise was made incorporating both the use of Mutton cloth and Terry-Towelling material in our pad design. The pad itself is 30 layers of mutton cloth securely sewn together. A cotton strip is sewn around the edges of the layered mutton cloth, to prevent

fraying from occurring. A hemmed piece of terry cloth, kept separate from the mutton cloth pad, is used as an extra absorbent layer, placed between the mutton cloth pad and the chitenge fabric.

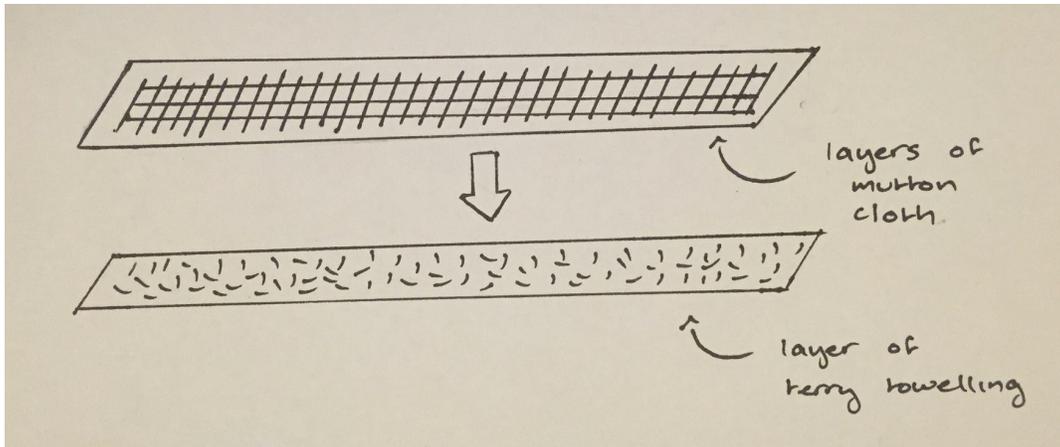


Figure 36: Diagram representing the two layers making up the pad, mutton cloth and terry-towelling.

This design takes into account the specific needs of the individual, being; comfortable, secure, durable against leaks, discreet, aesthetic and cost effective as well as utilising a simplistic design that is easily replicable.

3.3.2. Prototype Test Results

Through the process of auto-ethnographic research conducted by two members of our group, the team has determined the best dimensions for the final pad design.

Pad Inserts

Firstly, Team Member A tested the pad which was made solely from mutton cloth. She reported that this material was effective in that there was no period leakage, however drying time was slow at around 3 hours per pad insert. In order to speed this up without compromising on the pads effectiveness, we made the pads thinner, with the assumption that should the user require heavier absorbency, she could layer them.

Simultaneously, Team Member B tested the absorbency and drying time of the terry-towelling material. The drying time of this was around 2 hours. From this, we decided it was best to have two layers making up our final pad design; thin pads comprised of mutton cloth, which can be layered for extra absorbency, as well as a separate layer of terry-towelling. The terry-towelling is placed between the mutton cloth pad and the chitenge cotton (holding the pad in position) as an extra layer of protection. Team Member B reported that there was no leakage when tested on a heavy period, thus we have decided to use this as our final option.

One limitation that both team members A and B reported was that the length of the pad inserts was not long enough only being 15cm. Consequently, we decided to extend this in both the front and back of the pad so that it is now 20cm in length.

Pad Styles

Two different styles of pads were also tested by Team Members A and B.

The first being the 'belted pad' was reported to be relatively easy to move around in, however to keep it in place the front would require more material. Thus, we opted to adapt the cloth in said

location to be slightly wider (8cm across) to make sure users feel secure and comfortable in the pads with no risk of leakage.

The next style we tried was the bikini underwear with a wide front and back. The front was said to feel secure, however the back needed widening. This led us to combine the two designs together. Our final design consists of a chitenge-made garment extending 70 cm from front to back with a 100cm cloth belt which can be tied to fit securely on women and girls using the product.

3.3.3. Chosen Materials and Tools for Implementation

Chitenge

The main material used includes that of the chitenge. A popular locally sourced fabric that is easily affordable to the people of Mayukwayukwa. This fabric is also extremely culturally appropriate, with the women already utilising strips of the material to handle the menstruation, along with wearing it as skirts and dresses. Chitenges can be sourced in many varying vibrant colours and patterns, allowing our design to be aesthetically pleasing to the women of Mayukwayukwa. This may be beneficial in building women's confidence during their menstrual cycle, whilst lowering feelings of shame and embarrassment conjured by cultural taboos.

Terry Towelling

Terry-Towelling is an extremely absorbent material with a reasonably quick drying time. It is easily accessible locally, from the town Lusaka. Alternatively, it can be found from second hand materials, such as old towels. However, this material is costly, therefore we only use one strip of it to provide ultimate absorbency and protection against leakages.

Mutton Cloth

Mutton Cloth, provides an extremely absorbent pad, by layering the material (approximately 30 layers). It has a reasonable drying time, which is important in allowing the women to discreetly dry their pads and so they are available for sequential useage. This material can also be sourced from the nearby town Lusaka. Although this product is reasonably absorbent, it is still less so as compared to Terry-Towelling. However, the cost of Mutton Cloth is significantly lower than that of Terry-Towelling and is still a viable option, therefore Mutton Cloth is partly used in the final pad design in combination with Terry-Towelling.

Other materials

These are to be sourced at the local market

- Cotton Thread
- Scissors
- Stationery and measuring tools (pencils, pens, erasers, rulers)

Sewing Machines

Sewing machines provided through the following programs run in Mayukwayukwa. As such, a partnership between H.E.R and these programs would prove to be beneficial for local production and thereby long term sustainability of the manufacturing process.

- Caritas CR. Provides refugees in Mayukwayukwa with apprentice training (such as tailoring). Allows them access to sewing skills and machines. Funded by UNHCR and Czech Development Agency.
- Matambo Clinic. Runs sewing programs in the Café at Christ Temple to make hygiene kits for the women in Zambia. Provides Fabric scissors, pins, sewing machines, 100% cotton or flannel fabric and terry cloths.

3.3.4 Costs

In general, Mayukwayukwa residents average spending costs per month;

- 20-100 ZMK, for those who are poverty stricken. (\$2.67 AUD – \$13.30 AUD or \$2.05 USD - \$10.20 USD).
- 150-200 ZMK, for those who have a stable income. (\$20.00 AUD – \$26.66 AUD or \$15.34 USD - \$20.46 USD).

Our aim is to provide a design option that is affordable to everyone within the community of Mayukwayukwa, including the least fortunate of citizens. Taking into account the average spending costs per month, our design is economically viable.

The estimated cost of the required materials is as follows:

Chitenge

The chitenge cloth can vary in price. The cheapest (2m x 1m) in Kaoma costs about 20 ZMK (AUD \$2.67 or USD \$2.05) to 30 ZMK (AUD \$4.00 or USD \$3.07). The higher quality chitenges cost around 40 ZMK AUD (AUD \$5.33 or USD \$4.09).

Our design would use 0.5m² of chitenge cloth.

This would cost **5 ZMK** or **\$0.67 AUD / \$0.51 USD**.

(allow another 10% increase of cost to account for cotton)

We have utilised our knowledge of chitenge costs to provide a standard, from which we have calculated an estimate of costs for other materials. Chitenge cloth is approximately 0.025% of the cost of similar cotton cloth here in Australia. Therefore, assuming comparable reductions in other materials we have estimated local costs for the following materials:

Terry Towelling

Our design uses 160 cm² of Terry-Towelling.

Terry-towelling costs about twice as much of cotton, in Australia.

Assuming this is the same in Zambia, terry-towelling will cost about 40 ZMK for 2m by 1m.

However, one garment only uses 160 cm² of Terry-Towelling.

Therefore, we can get around 125 garments out of one 2m by 1m sheet of Terry-Towelling.

Hence, it costs **0.32 ZMK** or **\$0.04 AUD / \$0.03 USD** for 160 cm² of Terry-Towelling per garment.

Mutton Cloth

Our design uses 0.48m² (30 layers... therefore 30 times 160 cm²) of Mutton Cloth.

Mutton Cloth costs around the same as cotton, in Australia.

Assuming this is the same in Zambia, Mutton Cloth will cost about 20 ZMK for 2m by 1m.

However, one garment only uses 0.48m² of Mutton Cloth.

Therefore, we can get around 4 garments out of one 2m by 1m sheet of Mutton Cloth.

Hence, it costs **5 ZMK** or **\$0.67 AUD / \$0.51 USD** for 0.48m² of Mutton Cloth per garment.

Sewing machines and equipment (scissors, needles, pins)

Sewing machines provided through programs run in Mayukwayukwa. A potential partnership with a manufacturing group (see education plan section 4.3 for further details) would mean these come at little to **no additional cost**.

3.5.5. Measuring Success

Following the introduction of the Sanitary Pads for H.E.R into the community of Mayukwayukwa, it is necessary to go back and re-evaluate the products overall success. We designed this product, in the hopes of attaining specific goals. Our goals outlines can be found in section 1.5 of the report. The following targets listed, determine the overall success of our product.

3.5.5.1. Socio-Cultural

Arguably, the most important factor of our design, whereby the community actively engages with our implemented design option. Our design option is well-assimilated and culturally accepted into the community of Mayukwayukwa. Goals that we aim for include:

- 70% of all women, who have a menstrual cycle, own and use the Sanitary pads for H.E.R.
- Majority of the users are content with the product
- Majority of the users wish to continue using the product
- Majority of the men approve of the products, alongside this, they also approve of the washing and drying of the products
- There has been an increase in education and knowledge surrounding the menstrual cycle and hygienic processes
- 80% of school girls no longer miss out on school due to their menstrual cycles

3.5.5.2. Environmental

Materials required for our design product are sourced responsibly and locally. These materials are also adequate for the climate in the area and can be dried and washed with maximum efficiency. We hope to achieve the following aims:

- Locals still use chitenge cloth, mutton cloth and terry-towelling for the materials used in the Sanitary Pad for H.E.R
- The Sanitary Pads for H.E.R are durable and can still be reused by the women
- There is a decrease in sanitary waste in the community due to the increase of reusable pads
- The design washes and dries effectively and efficiently in the Mayukwayukwan climate

3.5.5.3. Economical

Our design is viable within the economic means of Mayukwayukwa and the bodies that support it. Alongside this, it allows the community to decrease its reliance on outside donors in the long-term and become increasingly self-sustaining. We hope that:

- At least 90% of women can afford to buy the Sanitary Pads for H.E.R
- A successful, economically stable business has been created, making the Sanitary Pads for H.E.R
- The Sanitary Pads for H.E.R should be reusable for up to a year

3.5.5.4. Final Evaluation

To ensure our final design fits within the Mayukwayukwa community, we have evaluated the Sanitary Pad for H.E.R against the criteria we outlined in Section 2 (Proposal Structure).

Design Criteria	Design: Sanitary Pad for H.E.R
Cost	<ul style="list-style-type: none"> → The cost for one Sanitary Pad for H.E.R package, including; <ul style="list-style-type: none"> - 4 Pads - Belted Underwear Pad Upholster → One pad costs an estimated 5.32 ZMK

- One Chitenge Belted Underwear Pad Upholster costs an estimated 5 ZMK
- Therefore, altogether, the Sanitary Pad for H.E.R package would cost an estimated **10.32 ZMK.**
- Sewing machines used within the charitable program Caritas CR, so come at no cost.
- This design is affordable, when the cost of the fabric is compared to the Mayukwayukwa residents average spending costs. Those who are poverty stricken spend approximately 20-100 ZMK per month. Those who have a stable source of income spend above 150-200 ZMK per month.
- As the design is reusable, it is incredibly economically viable to the residents of Mayukwayukwa

Size

- The Sanitary Pad for H.E.R, Belted Underwear is made to fit all shapes and sizes, the measurements we have suggested, can be easily altered to fit any body type.
- Recommended is a 100cm long belt
- The Belted Underwear is suggested to be 70 cm in length, beginning at a width of 8 cm at the front of the garment and extending to a width of 35 cm at the back.
- The Sanitary Pad itself, is 20cm long by 8cm width and 30 layers of Mutton Cloth thick.

Materials

- Chitenge

	<ul style="list-style-type: none"> → Terry-Towelling → Mutton Cloth → Cotton Thread
Aesthetic	<ul style="list-style-type: none"> → Chitenges can be sourced in many varying vibrant colours and patterns, allowing our design to be aesthetically pleasing to the women of Mayukwayukwa. → This may be beneficial in building women's confidence during their menstrual cycle, whilst lowering feelings of shame and embarrassment conjured by cultural taboos.
Manufacturing	<ul style="list-style-type: none"> → 2 separate components need to be manufactured. Thus, two patterns will be required. (Pad and Belted Underwear) → Can be made locally – manufacturing workshops can be set up in rural locations → This allows our design to be sustainable and provide long-term economic benefit to the community → The production of the underwear would occur through programs such as Caritas CR which provides access for refugees in Mayukwayukwa to receive apprentice training (such as tailoring). They are funded by UNHCR and Czech Development Agency.
Health and Hygiene	<p>Removable Pad Insert</p> <ul style="list-style-type: none"> → This product can easily be washed in cold water and left out in the sun to dry. Ultraviolet ray naturally kill

	<p>bacteria.</p> <p>Belted Underwear</p> <ul style="list-style-type: none"> → This product can also effortlessly be washed in cold water and left out in the sun to dry. <p>Mental Health</p> <ul style="list-style-type: none"> → Women will gain peace of mind through the use of our sanitary products. Anxiety about leakages will be drastically reduced and women are enabled to continue without shame or embarrassment regular everyday activities.
Sustainability	<ul style="list-style-type: none"> → Inexpensive → Produced from local materials → Re-useable → Provide an opportunity for the community to run micro-enterprises and manufacturing businesses, improving the long-term economic success of the community
Cultural Appropriateness	<ul style="list-style-type: none"> → Modest and discreet design → Mechanisms conform to cultural traditions and views → Use of culturally appropriate material <ul style="list-style-type: none"> - Chitenge: This fabric is also extremely culturally appropriate, with the women already utilising strips of the material to handle the menstruation, along with wearing it as skirts and dresses.

- This may be beneficial in building women's confidence during their menstrual cycle, whilst lowering feelings of shame and embarrassment conjured by cultural taboos.
- Removable Pad Insert can be dried efficiently, thus reducing time outside and being seen in public

Usability

Removable Pad Insert

- Inserts are thin and dry efficiently and quickly
- The layering of multiple inserts allows protection for more heavier flows
- The Pad has been designed for maximum absorbency to prevent against leakage
- The Pad is also made from soft materials and is extremely comfortable
- Foldable – easy to store/ carry

Belted Underwear

- Doesn't need to be washed as frequently as Insertable Pads, allowing for increased discretion
- The separation of Insertable Pads and Belted Underwear allows for quicker drying time
- Belted Underwear is durable and holds pads securely in place, preventing against leakages
- Belted Underwear accommodates for different body sizes and shapes, with adjustable belt

4. Education for H.E.R

Outline

The H.E.R Education Plan consists of three components: Instructional and Educational Visuals, Microenterprises and Girl's Clubs. Each of these components will work together to achieve the ultimate goal of reducing taboo, increase knowledge about the menstrual cycle and improve menstrual hygiene management in Mayukwayukwa for both the short and long-term.

4.1 Instructional and Educational Visuals

It is vital that women gain a basic understanding of menstruation, so that they can effectively and correctly manage their own cycle as well as trying to eliminate the taboo associated with menstruation. An education can allow women to question the myths and lies that may be present in their culture about menstruation. This inevitably reduces women's feelings of shame and embarrassment, as they now possess the understanding that it's a natural cycle and can feel more confident and empowered in themselves. Although a difficult task; learning about periods and discussing them openly via education, can hopefully over time breach the taboo.

An obstacle to women receiving this education however, is the lack of a commonly shared language. The refugee camp is home to women of many differing backgrounds (predominantly Angolan and Rwandan) and thus there are multiple languages spoken and written in. Imagery and symbols are known to be a universal language. Therefore, it is important to use images as a communication platform.

It is extremely important to provide with our sanitary products instructions on how to use them, how to wash and dry them and alongside this, provide some education on what is menstruation why it is happening. By providing information as to why women go through a monthly cycle, we hope that it will make girls feel more comfortable to discuss their cycle and thus slowly breach

the taboo. Seen below in Figure 37, Figure 38 and Figure 39 are some simplistic instructional images.

Diagrams

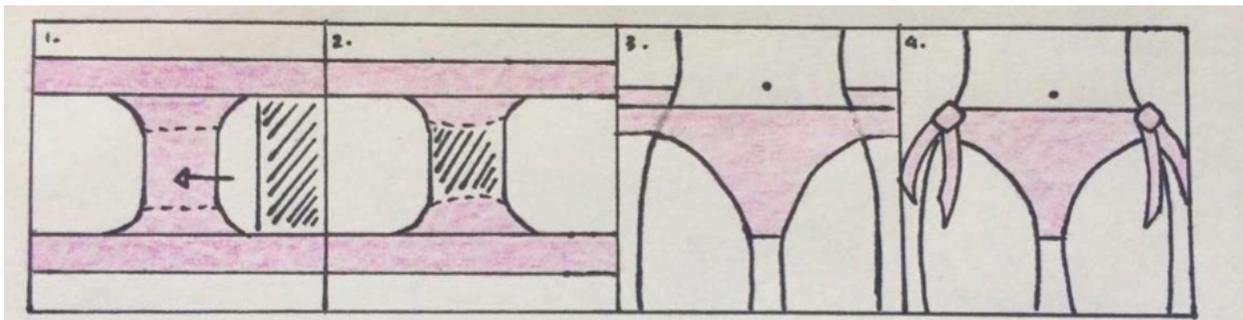


Figure 37: Instructional Visual on how to wear the Underwear.

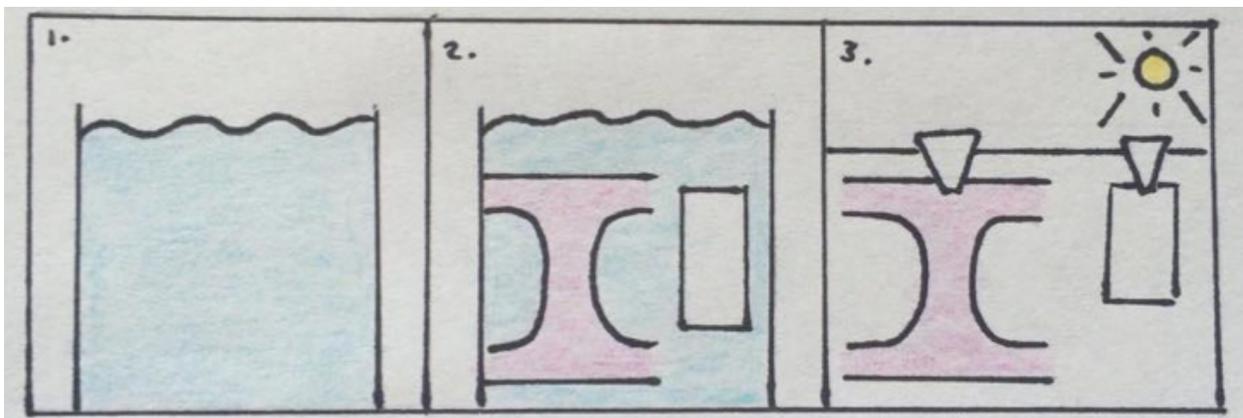


Figure 38: Instructional visual on how to wash and dry the Underwear and Pad.

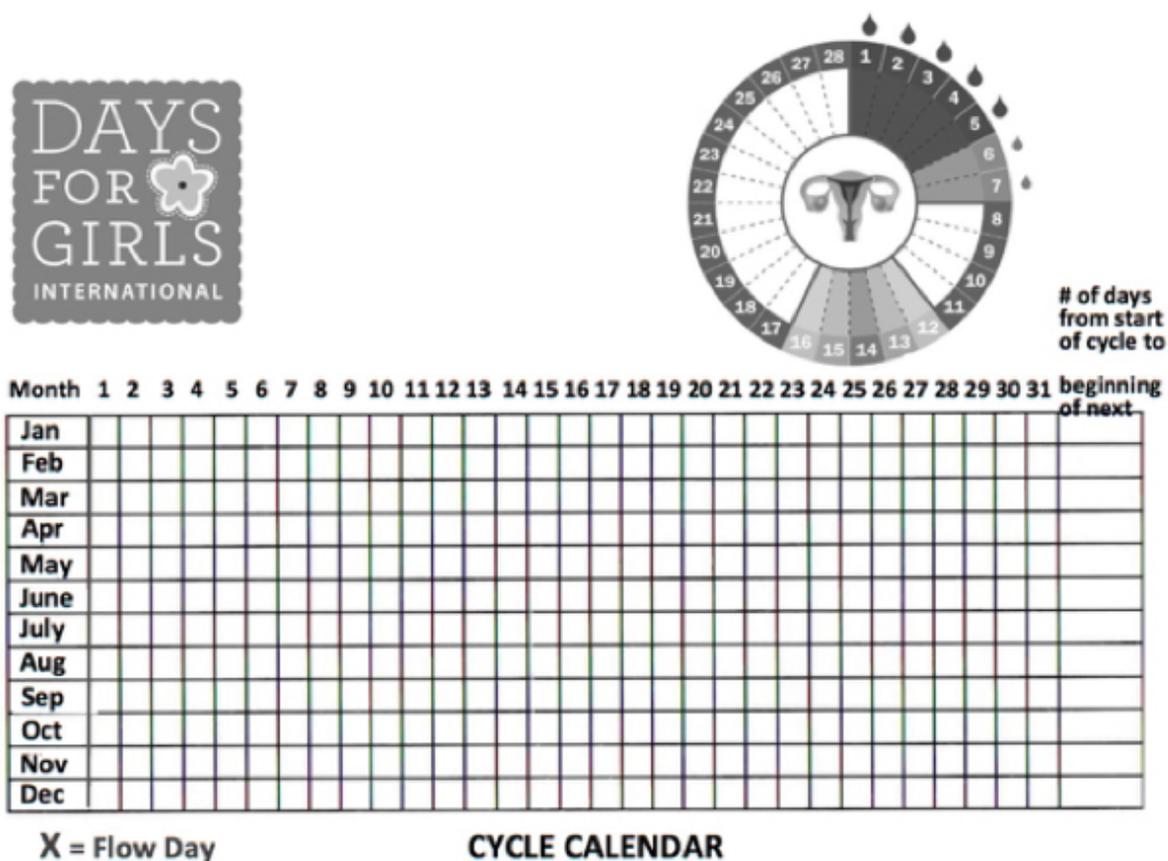


Figure 39: Sample of Instruction Visual attained from Days For Girls International, providing education on the menstrual cycle.

Evaluation

Criteria	Evaluation
Costs	→ The costs will be very minimal as the images will be traced/drawn on paper and handed out alongside the sanitary products (as there is no access to a printer/ computer).
Size	→ All three images will take up around one piece of A4 paper.
Materials	→ Pencil/pens in various colours

	<ul style="list-style-type: none"> → Ruler → Paper
Aesthetic	<ul style="list-style-type: none"> → The use of colour in the drawings can be used to create a more pleasant aesthetic to the instructions. This may help women feel less negative towards their menstrual cycle.
Manufacturing	<ul style="list-style-type: none"> → The instructions are easily drawn or traced onto paper with a pencil or pen. They are very simple drawings so this will not be a time-consuming process. This is necessary, as the locals do not have access to a printer in Mayukwayukwa.
Health and hygiene	<ul style="list-style-type: none"> → These instructions are a necessity. They must be provided alongside the sanitary products to ensure the women use them correctly and wash and dry them appropriately. They also provide a little bit of basic information about the menstrual cycle, refer to Figure 39. Figure 39 represents how menstruation is a cycle. This is extremely powerful to women as it allows them to predict and better manage their menstrual cycle. It allows the women to know when they are due, allowing them to be prepared in advance. It enables the women to know when something is wrong, whether they are pregnant by understanding that their period is late. Thus, allows them to be better aware of their health. The valuable knowledge women can possess from this small image can help empower them immensely.
Sustainability	<ul style="list-style-type: none"> → Locally sourced materials. → Paper comes from a renewable source and easily disposed of through composting. → Provides women with an education, which can be passed on

	through multiple generations
Cultural appropriateness	<ul style="list-style-type: none"> → The use of instructional images allows the communication of knowledge throughout Mayukwayukwa. Mayukwayukwa being home to many refugees, means there are many varying languages spoken and written in. Thus, it is essential for images to be utilised as a vehicle for communication. → In the product, instructional visuals as to how to put on the underwear could be seen as culturally inappropriate, due to the depiction of exposed skin of an area that is generally seen as private. Therefore the inclusion of hand-drawn cartoon-like figures will minimise negative reactions associated with the cultural taboo surrounding women's bodies.
Usability	<ul style="list-style-type: none"> → The use of images aids its overall usability by the women in the community and assures that the products are used effectively and safely/hygienically.

4.2. Building Micro-Enterprise Opportunities for Local Women

The proposed educational plan builds on the Caritas program that is currently funded in Mayukwayukwa by the UNHCR and the Czech Development Agency. This program aims to equip refugees with education and training in general and business skills such as tailoring, design, masonry and joinery. The program also provides training in business development skills such as economics and entrepreneurship. The Caritas program allows refugees in Mayukwayukwa to gain the valuable skills they need in order to earn livelihoods and reduce their reliance on donor

contributions under the UNHCR.

Using the skills from the Caritas program, this design option aims to benefit and empower the community through the manufacturing and distribution of menstrual health management products. The micro-enterprise will foster communication on women's issues (including but not limited to menstruation) and will allow the community to grow its profit and lift itself out of the cycle of poverty

Evaluation

Criteria	Evaluation
Cost	<ul style="list-style-type: none"> → Partially funded by Caritas Once the micro-enterprise has been established, ongoing costs will be low and generation of profit will be dependent on refugees' business know-how
Community Engagement	<ul style="list-style-type: none"> → Teamwork required in building and earning livelihoods provides refugees with direction and increased self-worth which stabilises mental health
Sustainability	<ul style="list-style-type: none"> → Allows refugee community to be self-sufficient and reduces reliance on donations from larger bodies like UNHCR
Cultural Appropriateness	<ul style="list-style-type: none"> → Women-Only micro-enterprise allows comfortable, open communication and development in menstrual health management without awkwardness associated with taboo
Achievability	<ul style="list-style-type: none"> → Easy for trainees to learn basic skills Pleasant environment of teamwork surrounds the training

	sessions
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4.3. After School Girl's Clubs

This component of the educational plan focuses on *Area 4* of the issue surrounding MHM in Mayukwayukwa. As described in the context section of this report, the African cultures present in the refugee settlement all treat menstruation as an extremely taboo subject with many erroneous myths and traditions about the process.

This highlights the importance of providing education in MHM. A proven method of overcoming taboos and empowering young women is what can be referred to as a 'Girls' Club'. This is essentially a discussion group that would take place after-school and provide a platform for girls to:

- Become educated on the biological mechanisms and reasons behind menstruation through creative tasks, group work and presentations.
- Share their concerns with their peers in a safe place.
- Become comfortable with discussing menstruation, thereby reducing taboo.
- Learn about women's health, hygienic practices and MHM (including how to effectively use a physical feminine hygiene product).
- In the context of Mayukwayukwa, we would be working with upper primary and secondary school aged girls (aged 9-17)
- The class will be run by trained facilitators/older women
- The club should take place in a classroom after school

Program Approach

The club is open to all young girls in the refugee settlement and requires at least one facilitator who is trained to effectively run the program. While a general discussion about issues, concerns and methods of MHM would suffice, the general structure of a meeting can take on many forms and include the following activities:

Role playing

This activity should take 50–60 minutes and requires a number of members of the club to volunteer as actors. The objective of the activity is to describe the basic reasons for and mechanisms behind menstruation through the creative medium of theatre. Through a role-play and a follow up discussion, club members should be able to list the challenges associated with managing menstrual periods at school (eg. anxiety from the potential of leakages). Following the play, the group should be able to identify small actions to address these challenges.

An example of a suitable script can be found on page 12 of this Menstrual Hygiene Toolkit provided by USAID and SPLASH (Schools Promoting Learning Achievement through Sanitation and Hygiene):

http://www.washplus.org/sites/default/files/mhm_toolkit2015.pdf

Story telling

“Oral African storytelling is essentially a communal participatory experience...Such participation is an essential part of traditional African communal life, and basic training in a particular culture’s oral arts and skills is an essential part of children’s traditional indigenous education on their way to initiation into full humanness.”

The above is a statement from the *Kwesukela Story Telling Academy* in South Africa and summarises the importance of story-telling in most African culture. Story sharing is a powerful tool in sharing information about MHM as it “acts as a metaphor for sensitive issues, making it a very simple and safe way to explore uncomfortable topics.” (“Making stories come alive”, 2013).

This will allow young girls to comfortably be told about the mechanisms of menstruation and methods of effective MHM. This will then allow them to make positive improvements in their practices. These stories need to be tailored to the cultural experiences of the students in the 'Girls Club' and, as such, would be and shared by facilitators and older women in the Mayukwayukwan community.

Games

SPLASH operates in Zambia and has effectively used games such as 'Snakes and Ladders' to emphasise key points about proper menstrual hygiene. The following is an excerpt from their 'toolbox' report (SPLASH, 2015) which outlines the process of the game which could be used as an engaging activity for the 'Girls Club':

SNAKES AND LADDERS:

SNAKES AND LADDERS:**→ Materials needed:**

- Paper
- Pens or markers
- Dice

→ Directions:

1. The objective of the game is to get to space number 30. Players start on number 1 and take turns rolling the dice to see how many spaces they move. Players keep moving up unless they land on the head of a snake or bottom of a ladder.
2. Lay the corresponding cards on the heads and tails of the snakes, and then the bottoms and tops of the ladders. When a player lands on a head of a snake or the bottom of a ladder, they read the cards placed there. After sliding up or down, they then read the cards on the tail of the snake or the top of a ladder.
3. If a player lands on the head of a snake, they will slide all the way down to the space where the tail of that snake lies.
4. If a player lands at the bottom of a ladder, they will move up to the space where the top of the ladder lies.

→ Additional Notes:

- The ladders correspond to positive behaviors or events that you can do in life relating to menstrual hygiene management or health in general. So when you do something positive, you get to move ahead.
- The snakes correspond to negative behaviors that you can do in life relating to menstrual hygiene management or health in general. So when you do something negative, you move backwards.



Figure 40: Snakes and Ladders Game instructions an gameboard

Examples of Ladders (positive behaviours in MHM)

- “You washed your hands after changing your pad!”
- “You talked to your teacher about any issues you have with menses!”

Examples of Snakes (negative behaviors in MHM)

- “You did not wash your pad with soap and hid it before it dried.”
- “You felt worried about your menses but did not share your feelings with anyone.”

Menstrual Hygiene Day

Menstrual Hygiene day is an international event that “raises awareness of the challenges women and girls worldwide face due to their menstruation and highlights solutions that address these challenges” (MHD, 2016).

It is important to note that both Males and Females must be educated about the Menstrual Cycle in order for popular myths and taboos surrounding the subject to be abolished. An event such as Menstrual Hygiene Day provides the perfect platform for this to occur. This day would give an opportunity for the ‘Girls Club’ members to share what they have learnt with the wider

community and, perhaps more importantly, a chance for young boys and men to support their peers and become educated about the menstrual cycle.



Figure 41: Promotional image for Menstrual Hygiene Day, "MHD".

Peer-to-peer learning model

This form of learning allows older girls, who are aware of good MHM practices, to mentor younger girls who have just reached menstruating age or have not as yet reached puberty. This method is an ideal approach to 'Girls Club' meetings in the future, after the initial knowledge from facilitators has been introduced to the Mayukwayukwa community.

This model is able to "create intergenerational change" by allowing educated girls to influence the other female members in their families and wider community. This form of knowledge-sharing allows change to occur on a much larger scale and in a more sustainable way. One girl has the ability to share the knowledge she gained about MHM with many more girls. These girls will go on to teach many other girls; and so it goes on. The disempowering cycle of poverty and

inequality caused by cultural taboos and a lack of education is thereby replaced by a new cycle; a cycle of education and empowerment.

4.2. Final Program

In summary, the “Education 4 H.E.R.” plan combines the educational value of three aspects:

- **Visual Instructions:**
Using simple, visual instructions for safe, hygienic use of the physical sanitary pad product as well as informing the community about the natural menstrual cycle
- **Micro-Enterprise:**
Applying the teamwork and vocational skills of the existing Caritas CR program and the capacity-building nature of creating a female-led micro-enterprise selling pads in order to empower women
- **After-School Girl’s Club:**
The creation of a special “After-School Girl’s Club” that acts as a safe space for young women to bond, learn from each other and ask questions about menstruation and other women’s issues without fear of rejection or ridicule

4.2.1. Cost of Necessary Materials

Visual Instructions

The costs associated with the inclusion of hand-drawn visual instructions within the product will be minimal as the materials required can be easily sourced locally. In addition, according to the

proposed method of hand-drawing images, there will be no need for expensive resources such as electric printers or computers.

Micro-Enterprise

The costs of implementing this micro-enterprise, to begin with, will be minimal as women in the community

After-School Girl's Club

The proposal of this facet of the Education 4 H.E.R. plan will utilise the current stakeholders in the community that have interest in the empowerment of women and girls. Naturally, this would lead us to use the strengths of the older women in the community who already have acceptance within the community's social structures and hold influence in teaching the younger generations about life.

4.2.3. Implementation

The proposal of Education 4 H.E.R. aims to encourage women in Mayukwayukwa to practice menstruation management safely and give them the tools they need to empower themselves economically and socially in an environmentally-conscious manner. This includes creating social spaces that are emotionally 'safe' for women and girls to share their experiences, ask for advice from elders or ask questions without shame.

4.2.4. Measures of Success

4.2.4.1. Socio-Cultural

In general, the biggest positive factor of this design proposal is its ability to include all members of the community that are directly affected by menstruation, namely women and girls. By including females of all ages in the society, from young girls in the after-school club to adult women training under Caritas CR as tailors – there is a higher chance of the educational value of the program being retained in the long-term. The decision to empower women in Mayukwayukwa by prioritising the discussion of these issues to women-only circles enables the women to primarily express themselves freely without fear of social stigma or shame associated with male recognition of menstruation. That being said, our group understands that over time, the inclusion of males in the discussion of menstruation is vital to eliminating widespread cultural taboos and gender inequality. Our team hopes that with the implementation of this proposal, the community will be able to take the first step towards change and will be more open to further improvement in the future.

However, there are still potential drawbacks to the proposal that could include the lack of authenticity and local ownership of the proposal as well as possible lack of participation of women in the program. Women being too afraid or embarrassed to engage with this proposal in any way could prove to be a big challenge in changing the negative stereotypes associated with menstruation and effecting lasting social change in the community. However, we hope that by encouraging the ‘safe space’ nature of the groups, women will eventually gain confidence in discussing these issues and managing their periods effectively in the open.

4.2.4.2. Environmental

The environmental benefits associated with local production of the reusable pads as described in previous sections of this report are undeniably the most effective way of engendering positive effects on the community. This can be implemented with the use of sustainable materials such

as recyclable paper for instruction sheets and the use of reusable sanitary pads instead of disposable sanitary pads to foster environmentally responsible practices in Mayukwayukwa.

4.2.4.3. Economic

The economic cost outlay of using the current resources available in the community (such as skills, manpower and existing programs such as Caritas CR) as a starting point will ensure the economy of Mayukwayukwa is able to gradually grow and diversify itself. In particular, the establishment of the micro-enterprise that manufactures and distributes the sanitary pads to the community will teach women valuable business and communication skills that will enable them to expand their outreach to other regional groups and build their confidence as businesspeople.

4.3. Final Evaluation

After extensive research and feedback, the final evaluation of Education 4 H.E.R. is that it is an engaging and informative proposal with the potential to engender long-term change in Mayukwayukwa. Through practices within the women's and girl's groups that encourage collective group participation, community members are open to countless opportunities to learn new information to benefit themselves as well as help others by passing the information on. The emphasis on establishing emotionally-safe female-only spaces for women to discuss their issues privately reduces the chances of shame and retaliation due to taboo and social stigma around menstruation. This allows all sessions conducted within Education 4 H.E.R. to be informative in providing educational value about the biology of menstruation, hygienic practices and reiterate the normalisation of the cyclical process of menstruation. Furthermore, the concept of 'locals teaching locals' creates a sense of ownership over the process of change in the society. Designed in a way that is easy to learn and share, Education 4 H.E.R. has the potential to incite social change in Mayukwayukwa that will have a 'domino effect' on other aspects of the community related to menstruation stigma and gender issues, ensuring long-term positive change.

5. Additional Proposals

As described in section 1.3, the problem surrounding MHM in Mayukwayukwa is multifaceted. Although the focus of this report has been the implementation of a physical product and an educational plan, it is vital that the lack of facilities to change and transport used pads to and from schools is taken into consideration for long-term success in MHM. Similarly, although the educational plan will optimally reduce the taboo which prevents women from drying their sanitary products in public, a suitable product which allows conservative drying will prove useful in context. As such, this section provides possible solutions to issues 2 and 3 (refer to Figure 7 in section 1.3) of MHM in Mayukwayukwa.

5.1. The “Pad Bag”

This product is a dual-function drawstring bag designed to be both a waterproof carrier bag for transporting reusable pads from work or school to home. The Pad Bag also functions as a discreet drying bag. This design is significant due to the widespread, debilitating social stigma attached to menstruation in Mayukwayukwa as described in-depth in Section 1.2.5. Cultural Attitudes Towards Menstruation.

The Pad Bag consists of two layers, one inside of the other, with each bag featuring a drawstring mechanism for closing and ensuring security of used pads that will be stored inside it. The outer layer of the bag will be constructed out of hessian which is a natural, sustainable material that can be obtained locally and ‘upcycled’ from the bags used to transport tobacco and other agricultural goods in the region. The inner layer will be made from PUL or polyurethane laminate which is a waterproof, breathable, synthetic material. This design option can be varied

in size to suit different pad sizes according to a woman's specific needs. It is easily handmade and does not require extensive machinery to manufacture.

That being said, the costs associated with manufacturing the Pad Bag are still additional to the costs that are required to manufacture the reusable pads which the women in Mayukwayukwa need urgently. Despite the fact that the period taboo is so pervasive in the community, as a group, we have had to prioritise the need for reusable pads. Therefore, the proposal of the Pad Bag has been designed as an add-on solution if extra funds are available.



Figure 42 (above): The hessian outer layer of the bag is discreet and has a natural aesthetic

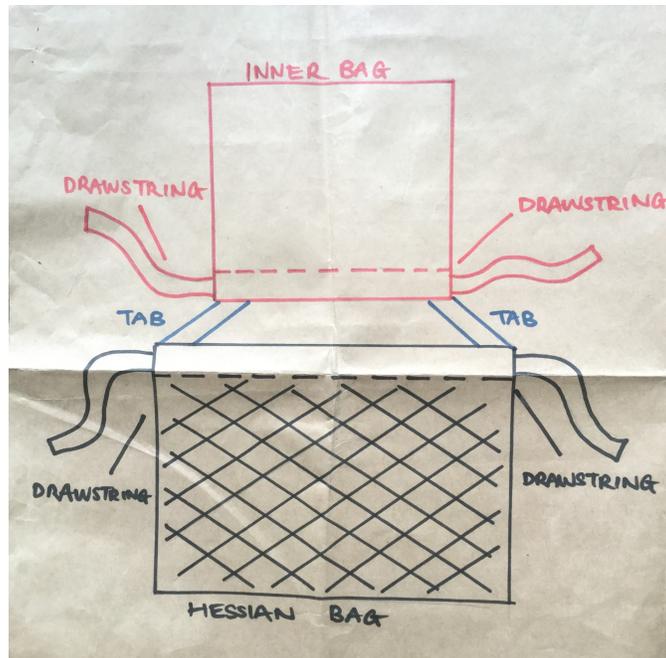


Figure 43 (below): Diagram depicting the side view of the bag with the inner layer pulled out

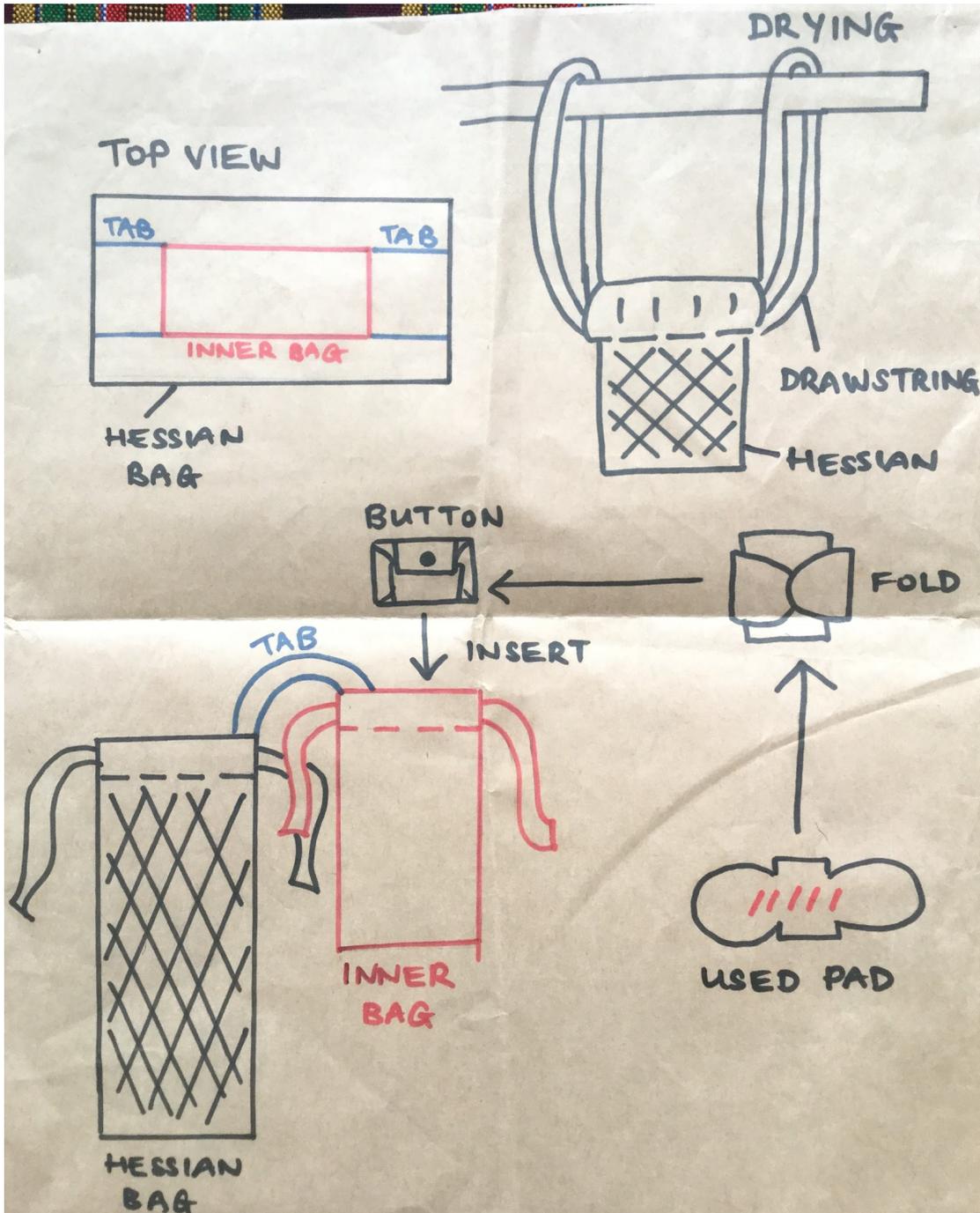


Figure 44: Diagrams depicting the Top View of the bag & Proposed drying set up

Evaluation

Criteria	Evaluation
Cost	<ul style="list-style-type: none"> → Hessian bag materials and thread are affordable and locally available → PUL lining for inner bag is not affordable and has to be imported from overseas or from large city centres
Size	<ul style="list-style-type: none"> → Can be adjusted according to personal needs but average size is portable and effective
Materials	<ul style="list-style-type: none"> → Hessian does not degrade quickly and can be maintained easily → PUL is waterproof therefore can be maintained easily as well, requiring only water and a quick wipe down to clean it → Drawstring material is durable
Aesthetics	<ul style="list-style-type: none"> → Natural material of hessian blends with the natural landscape of Western Zambia and increases its invisibility → Colour of inner PUL layer can be chosen to specifically blend with natural aesthetics of the environment
Manufacturing	<ul style="list-style-type: none"> → Can be handmade and doesn't require heavy machinery → Can also be tailored on sewing machines if necessary → Would be coordinated under the UNHCR/Czech Development Agency-funded Caritas program which allows refugees to gain useful apprentice training
Health & Hygiene	<ul style="list-style-type: none"> → Hessian material is breathable and lets both sunlight and air through the bag during the drying process - speeding it up and also allowing for disinfection by UV rays → Taboo-induced anxiety about menstrual products being

	<p>exposed to others is alleviated due to the hessian material being discreet</p> <p>→ PUL layer does not absorb menstrual fluid from the transportation of used pads from school/work to home - this protects women's sanitary hygiene and prevents infection</p>
Sustainability	<p>→ Hessian can be "upcycled" therefore reduces the need for new materials to be produced</p> <p>→ Entire bag can be reused and can last for a long time if well-maintained</p>
Cultural Appropriateness	<p>→ Appropriate for the cultures in Mayukwayukwa considering the taboo surrounding menstruation is extremely widespread and debilitating for women</p> <p>→ The product does not directly challenge their beliefs or cultural practices and therefore is more likely to be accepted in the community</p>
Usability	<p>→ Dual functioning bag provides convenience and comfort to women who have busy lives at school and/or work</p> <p>→ Bag (when converted into drying bag) can be hung from any object and provides women with flexibility they did not have previously when drying their sanitary products</p>

5.2. The "Girl's Hut"

If funds are available, we also recommend the construction of '**Girl's room**'; a hut that contains inbuilt washrooms which provide a safe, clean and private place for girls to change feminine hygiene products and a place to rest/lie down if their menstrual period is causing them pain

during school hours. A space such as this should be situated next to each of the schools in the district and, thus, provide a solution for the second issue outlined in section 1.3.

The construction of such a space has shown to increase attendance at school as girls are able to manage their period outside their homes. In the Chipata district of Zambia, for example, attendance for girls at the Mkanda Mateyo local school increased by 2.5 times regular numbers after the construction of the latrines (SPLASH, 2015).

6. Final Conclusion

Our team was tasked with designing a proposal addressing the issues the community of Mayukwayukwa faces with regards to menstruation management in the community. These issues include but are not limited to the lack of an effective, sustainable sanitary pad product as well as cultural taboos surrounding menstruation and women's bodies and the resulting gender inequality.

The complexity of the issues faced by the women in the community has caused our team to provide solutions for both short-term and long-term needs. This dual-nature approach has resulted in our final proposal of both a physical product and an accompanying educational plan in the community.

The final physical product is adjustable belted pad with reusable cotton inserts that can be layered to adjust thickness and absorbency according to one's needs. The design of a reusable pad builds on the current menstruation management strategies the women of Mayukwayukwa practice which involves using cloth-based pads. The design of our physical product aligns with

the women's cultural traditions closely, and therefore will have a higher chance of being accepted in the community.

Together with the implementation of the physical product, the second part of our proposal involves establishing a comprehensive educational plan in the community that will tackle menstruation stigma and gender inequality at a gradual pace. The final proposed educational plan comprises the formation of women and girls' groups, the creation of a micro-enterprise manufacturing pads and the inclusion of visual instruction sheets within the product itself.

The most important criteria we needed to meet (both for the physical product as well as the educational plan) were sustainability, cultural sensitivity as well as the engagement of community members of all ages.

In designing sustainable solutions for female empowerment and poverty alleviation in less developed communities such as Mayukwayukwa, our knowledge in sustainable engineering has grown. We have grown to recognise the importance of being lifelong learners; learning from different communities and varying cultures. All of us from Team H.E.R. hope that the model of this proposal can effectively be used to effect positive social change in other communities in the region that have cultural similarities to Mayukwayukwa. We hope that this report will kickstart a continuous cycle for women in developing nations; a cycle of education, hope and empowerment...period.

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8. Appendices

8.1. Appendix A

Absorption	
Raw Material	Absorption value
Cotton Balls	28.45
Foam	14.99
Terry Cloth	13.5
Interfacing	7.68
Mutton Cloth	2.16
Cotton Cloth	2.9
Plastic	2.6

8.2. Appendix B

Retention	
Raw Material	Retention Ratio
Cotton Balls	9.72
Foam	3.61
Terry Cloth	9
Interfacing	2.11
Mutton Cloth	1.72
Cotton Cloth	1.45
Plastic	0

8.3. Appendix C

Drying Time	
Raw Material	Time taken to dry (hours:minutes)
Cotton Balls	7:50
Foam	2:30
Terry Cloth	2:50
Interfacing	0:37
Mutton Cloth	2:03
Cotton Cloth	0:32
Plastic	1:20