

Advancing Climate Change Knowledge Within Namibia Through a Virtual Exhibition

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ABSTRACT

Knowledge of climate change in Namibia is very low. To try and increase this knowledge across the country, our team worked with EduVentures to update and implement a virtual climate change exhibition. We researched recent climate change statistics that could be used to update the existing exhibition from 2016, based on feedback received through interviews and focus groups. The exhibition panels were updated with the intent of being used virtually and presented in person to schools around the country. A virtual outlet for the exhibition was researched and the team prepared EduVentures for the process of uploading the exhibition upon its completion.

ACKNOWLEDGMENTS

This project's completion would not have been able to occur if it were not for our sponsor EduVentures Trust as well as our advisors. Through many challenges, EduVentures remained committed to giving us as much support as possible. This project opened our eyes to climate disparities in Namibia and allowed us to contribute to the meaningful work being done at EduVentures daily. Our project lead, Fernando Felipe, was there every step of the way helping to facilitate conversations with key informants. The creative director, Hangula Warner, gave us the feedback needed as well as worked on our schedule to make sure everything was completed promptly. We want to thank Corris Kaapehi, the project manager at EduVentures, for organizing such a great project for us and always being responsive when troubles arose. We appreciated all of the kindness shown to us by the entire EduVentures team, it was an honor to work with all of them. Lastly, we wanted to acknowledge the committee of experts we used in our focus group. Through their work, we gained key information and feedback that allowed for the greatest success of our project. We also wanted to thank our advisors for guiding us throughout our time in Namibia. Finally to WPI for giving us the means to travel to such a beautiful country and for the opportunity to make an impact.



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INTRODUCTION

ADVANCING CLIMATE CHANGE KNOWLEDGE IN NAMIBIA

Environmental Health and Education in Namibia

The climate is highly variable in Namibia, often resulting in droughts and floods, both of which have become more common in the past twenty years. As climate change continues to worsen, natural disasters have become more severe. This was seen in 2011 when sixty-two people died and half a million were affected due to a local flood (Namibia Floods, 2011).

Figure 1

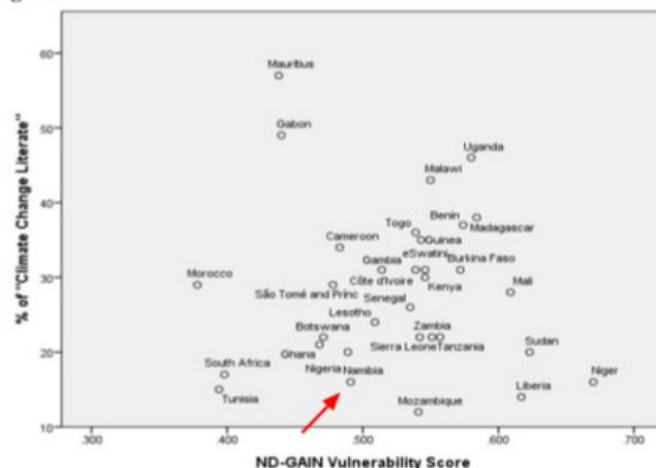


Note: (Northern Namibia Flooding 2011, n.d.)

The Namibian government has increased its efforts in disaster risk management, attempting to better prepare the country for the inevitable effects of climate change. The government has developed a Climate Change Strategy and Action Plan (CCSAP) along with national climate change policies to better forecast future disasters from causing as much damage (World Bank Climate Change Knowledge Portal, n.d.). However, awareness of climate change is very low as only about 52% of the Namibian

population is aware of climate change and only 16% of the population has a climate change literacy (Selormey et al., 2019). Those who are aware of climate change have three major perspectives. The first is the loss of traditional practices, otherwise known as indigenous ideology, which has caused more droughts and floods to spread throughout the country (Siyambango et al., 2015). This is a sentiment felt throughout the country. The second perspective is similar to the doomsday ideology, which perceives humankind as facing the end of the world (Siyambango et al., 2015). The third perspective supports the notion that human beings are the main components of climate change (Siyambango et al., 2015). Increasing awareness of climate change and its effects on people will allow individuals to make more informed decisions to answer climate change and lead to a more environmentally friendly society (Nazario-Leary et al., 2021).

Figure 2



Note: (Selormey et al., 2019), Arrow Points to Namibia on Graph

Educational Implications

The most common understanding of climate change has been based on indigenous knowledge, which is used to solve issues such as droughts, floods, and food scarcity (Siyambango et al., 2015). Some Namibians do not understand the damage of climate change. Many who are unaware are the most affected, experiencing flooding, droughts, and wildfires. Adapting a better understanding of climate change and its damages will allow for better resiliency and future choices (Nazario-Leary et al., 2021).

The EduVentures Trust is a Namibian Non-Governmental-Organization (NGO), in Windhoek, Namibia, which is an organization within the National Museum of Namibia. Established in 2003, the Trust aims to promote environmental awareness and sustainability among Namibians (EduVentures, n.d.-a). They work to promote these ideas through methods including but not limited to, museum exhibits, hands-on learning activities, and online videos. EduVentures presents climate change statistics and information using 12 physical panels.

Figure 3



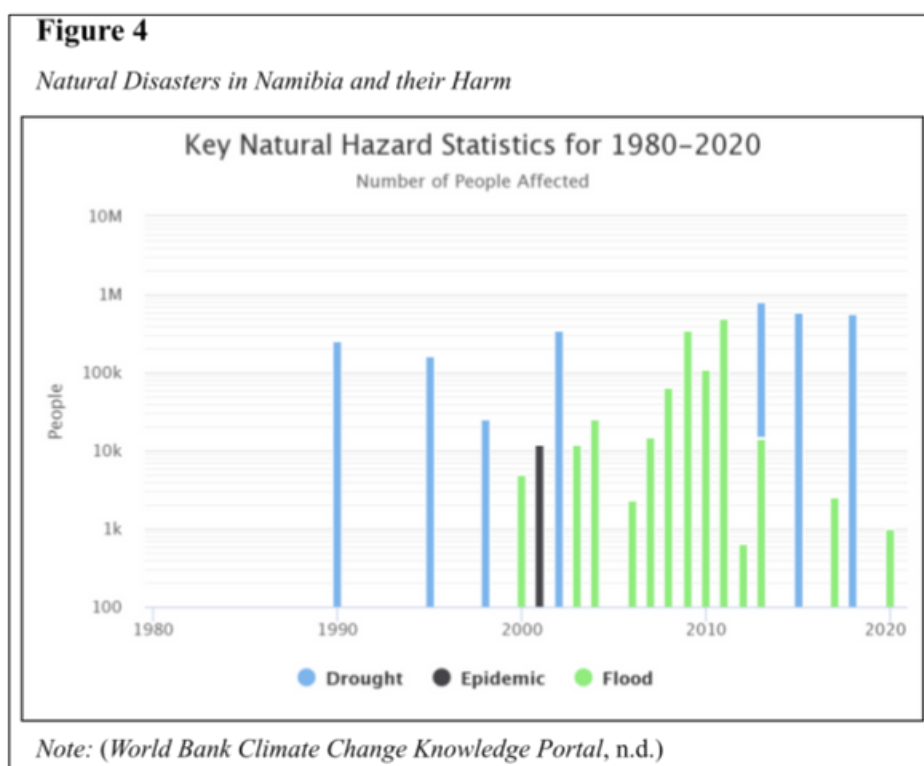
Note: (EduVentures, n.d.), *EduVentures Mobile Classroom*

The panels are covered in facts and images of climate change and are brought across the country teaching viewers the dangers of climate change and how it impacts them. Along with basic statistics, it provides information on what climate change is and how it occurs. Their primary audience for their exhibition is disadvantaged youth but they hope to spread their scientific knowledge to all, establishing greater environmental literacy throughout Namibia (EduVentures, n.d.).

A mobile climate change classroom was found to be an effective strategy for educating young people living in rural regions with limited access to information. The Trust also provides scientific services and organizes environmental awareness events that align with its goals. EduVentures works with the Museum Association of Namibia (MAN), Deutsche Gesellschaft für Internationale Zusammenarbeit,(GIZ), and various government agencies in Namibia to achieve its goals (EduVentures, 2019). MAN is a non-governmental organization with a focus on representing museums in Namibia as well as facilitating interaction and supporting the museums. GIZ is a German initiative set on establishing sustainable development throughout Namibia and other nations.

Climate Change Resilience

As one of the driest countries in sub-Saharan Africa, Namibia has been experiencing persistent drought conditions since 2015 (Namibia Drought Assessment Report 2022 | IFRC, n.d.). Climate change has exacerbated the dry conditions causing droughts to become more severe. Along with consistent dryness, floods have become more common due to the changing climate. Since 2000, there have been thirteen major floods affecting thousands of people, the most damaging in 2011 affecting half a million Namibians (World Bank). Namibia continues to become more vulnerable to natural disasters as climate change continues to worsen.



Climate change has accelerated land degradation, disrupting farming and grazing lands. The degradation of land results in poor crop production, and in turn, fewer meals a day resulting in malnutrition (Namibia Drought Assessment Report 2022 | IFRC, n.d.). The agriculture sector of Namibia impacts 70% of the population, most relying on rainfed crops (World Bank Climate Change Knowledge Portal, n.d.). Continued droughts lower the production of valuable crops, hurting Namibia's GDP. Namibia has an arid climate, with only 2% of the surface being arable land and 46% being available for perennial pastures (World Bank Climate Change Knowledge Portal, n.d.). The grassy landscape and cultivable savannah are expected to be overtaken by arid shrublands and deserts, losing the potential to be properly farmed. (Newsham & Thomas, 2011). Not everyone is prepared for the unpredictable and fluctuating effects of climate change. Most Namibians have been at higher risk of water scarcity (Figure 2), wildfires, and urban or river flooding (Figure 3). These threats are exacerbated by climate change, threatening more lives and health.

Figure 5

Risk of Water Scarcity in Namibia

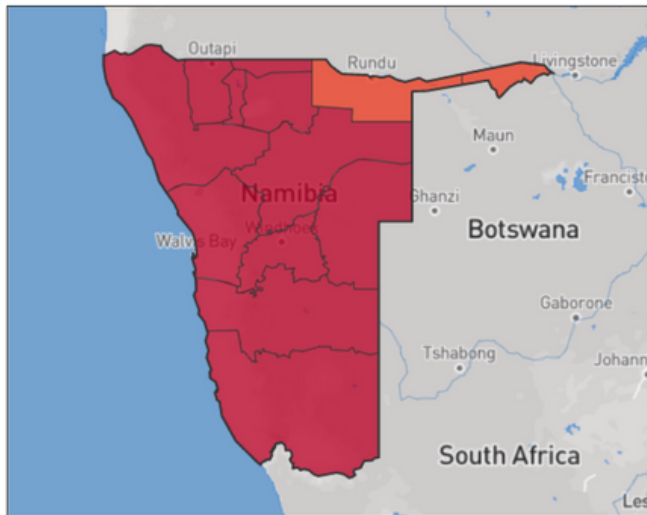
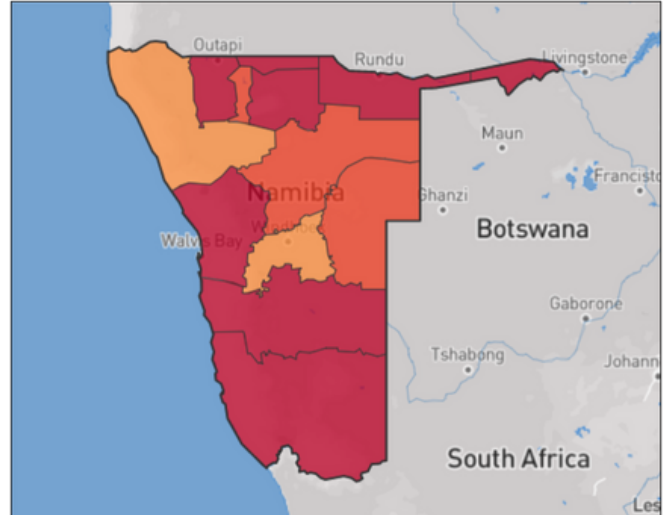


Figure 6

Risk of Urban Flooding in Namibia



Note:(Think Hazard - Namibia - Water Scarcity, n.d.). Darker Red = Higher Risk

EduVentures has a wide reach to rural regions of Namibia and is teaching individuals the damages done by climate change. However, COVID-19 has brought difficulties in traveling across the country, causing climate change awareness to come to a halt in some regions leading to a need for educational changes.

Virtual and Visual Environmental Education

The COVID-19 pandemic shifted life to an isolated virtual world, and to continue teaching, education needs to move virtually. A concerning topic that has become challenging for online education has been threats to the environment. Environmental education information can be complex, unclear, and frightening. Climate change has become a large topic in environmental education, as its consequences continue to be felt and continue to worsen. A gap has formed in environmental education, however, and several universities, such as the University of Florida, have developed interactive programs to fill the gaps (Nazario-Leary et al., 2021). The Center for Precollegiate Education and Training (CPET) has found that learner-centered activities and interactions allow for a stronger understanding of subjects (Nazario-Leary et al., 2021). Cynthia Nazario-Leary (2021) discusses the creation of an engaging learning experience, similar to in-person interaction, filled with games and visuals.

FIGURE 7



(“VIRTUAL EXHIBITIONS • DOT-ART,” N.D.)

Environmental education is filled with content that can be challenging to retain. Providing visual education can be an effective strategy to help memorize information and improve the general grasp of the subject (Vanichvasin, 2021). Visual information is less intimidating than a page of sentences and allows people to see the main ideas easily. In Thailand, teachers found several specific visual teaching styles effective, such as graphics, animations, videos, and typography (Vanichvasin, 2021). A more visually appealing virtual style is found to be more effective and beneficial to the learners.

Having a basic understanding of the environment and the effect that actions have on it allows for better resiliency to unknown consequences and also the prevention of future issues. Nazario-Leary (2021) further mentions that gaining a better understanding of climate issues may inspire students to take action in their community and life. Basic environmental education can go a long way and providing this information virtually and visually can help learners better retain information. EduVentures understands this concept and can bring education to a larger population through virtual climate change exhibits.

Figure 8



Note: Coast at Swakopmund

METHODS

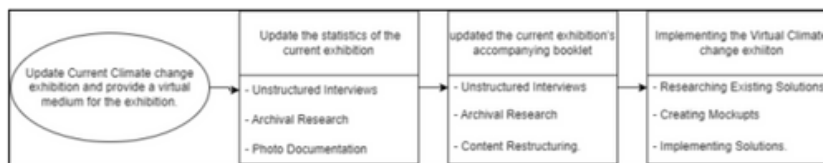
A VIRTUAL AND INTERACTIVE APPROACH TO CLIMATE CHANGE EDUCATION

The goal of this project was to update the climate change exhibition created by EduVentures in 2016 and provide a virtual medium for the exhibition so that more communities can access the information. The current exhibition uses 12 physical panels to display climate change statistics and information. The exhibition uses an accompanying booklet with more information about climate change to allow further understanding for the viewers. To satisfy the goal of this project the team:

- updated the statistics of the current exhibition;
- created a skeleton draft of the accompanying booklet; and
- created a guide to implement a virtual exhibition.

This chapter outlines the methods used to complete our goal and objectives. It includes a flowchart of the project's timeline with each method connected to an objective.

Figure 9



Note: Flow Chart of Goals, Objectives, and Methods

Updating the Current Exhibition

The following section outlines the methods used to update the current exhibition. To ensure that the exhibition is engaging and informative, a variety of methods were employed, including replacing and adding objects, updating exhibit labels or panels, changing the exhibit layout, adding interactive elements, and incorporating board members' feedback. The methods used were tailored to meet the specific needs of the exhibition and were guided by its theme and goals. An unstructured interview was conducted with one of the original creators, Hangula Werner, to understand their motives and reasoning for the flow of the exhibition. Archival research using online databases was used to update the statistics. Photo documentation was used to add imagery of climate change seen throughout Namibia.

To gain a deeper understanding of the exhibition's flow and target audience, we held an in-person, unstructured interview and discussion with one of the original creators, Mr. Werner. The entire team was present, and we asked a variety of questions about each specific panel to understand better what needed to be updated and how the exhibition flowed. An unstructured interview was chosen because it allows the informant to lead the conversation, covering new topics as they arise and providing information the interviewer may

have been previously unaware of (Berg & Lune, 2011). During the interview, we focused on predetermined topics of discussion but allowed Mr. Werner to guide the conversation as much as possible. By doing so, we gained valuable insights into the original vision for the exhibition and how it could be improved to better serve its intended audience. The interview was held at EduVentures headquarters in Windhoek to facilitate an open and comfortable conversation.

To gather accurate and up-to-date statistics and data regarding climate change in Namibia, the team conducted archival research using a variety of sources. Archival research is a cost-effective method of obtaining a large quantity of information (Digital Archival Research Guide: The Social Sciences Research Center, 2023). The team used several databases, including the Namibia National Determined Contribution 2021, World Bank Climate Knowledge, and the United Nations, among others, to find reliable and relevant data. The collected data and statistics were compared across various sources to ensure their accuracy. Before presenting the information in the final exhibition, the team submitted it to a committee assembled by the Museum Association of Namibia for approval. The committee became a focus group for our project and met with our team in person at EduVentures to review the information on each panel. We recorded the meeting and coded it looking for aspects of the panels that

continued to be mentioned. By coding, the team was able to determine the most effective style for the exhibition. In addition, commercially available photographs were added to each panel to depict specific events such as floods, hurricanes, and droughts.

Updating the Climate Change Booklet

After updating the content and statistics of the 12 panels of the climate change exhibition, our focus shifted to redoing the accompanying climate change booklet. Similar to the panels, much of the information in the booklet was out of date and needed to be updated. We determined that the booklet could accompany the panels more effectively if it included more interactive activities. The accompanying booklet included additional information regarding climate change and various activities that connected to each panel. The booklet was originally meant to be handed to viewers of the exhibition after they had finished looking at the panels. The team decided that it would be better if the booklet was instead given to viewers as they observed the panels.



Figure 11

Climate Change Booklet Cover Page



To better understand the purpose and the content of the booklet, the team held an unstructured interview with Mr. Werner. By using predetermined topics of discussion (Berg & Lune, 2011), the informant was able to lead the conversation and provide insight into how the booklet connects to each exhibition panel. With this information, we were able to identify necessary changes and improvements for the booklet.

Archival research was also utilized to update the data presented in the booklet. The same resources used to update the original exhibition panels were consulted to ensure the information was accurate and up-to-date. Additionally, we collaborated with our sponsors to determine what interactive activities would enhance the visitor's experience with the booklet.

Implementing the Virtual Climate Change Exhibit

Our team researched virtual exhibition styles to fulfill EduVentures' request for an interactive and virtual exhibit. We analyzed several case studies that shared similarities with our project to determine the effectiveness and interactivity of each virtual exhibition style. Our primary goal was to find a format that could be implemented in future exhibitions. We discovered that visual communication of data over time and future projections are recommended to help stakeholders understand climate change better (Davis et al., 2020).

After comparing multiple different styles and formats, we decided on what would work best for the exhibition. Through our comparison of different sources and sites, the team decided that Ikonoscope would provide the best format for the virtual exhibit. Upon speaking with a representative of the site, we learned about the full potential of the site and what it had to offer. With the ability to create a layout of your choosing to display all the panels and the capacity to add multiple audio recordings, the team, and our sponsor agreed that this site would work the best.

With the site chosen, all that remained was to create the exhibition and integrate it into the EduVentures website. However, the team was faced with two issues. The first of these issues was that of cost. Our sponsor agreed that the Ikonoscope platform was worth the price as it offered all of the features that they were searching for, however, EduVentures was unable to provide the funding at the time. The second of these problems was time. With a limited time to work on this aspect of the project and the budget at a standstill, our team could not afford to wait for the funding.

As a solution to this dilemma, we decided to create a guide that our sponsor could use to create and implement the exhibition in the case that we would have to leave before this could be completed. The guide detailed all of the steps required to put all of the panels in place as well as how to implement the audio to the exhibition. The audio of this exhibition would also have to be recorded at a later time since Mr. Hangula Werner was unavailable to record himself presenting at the time that we were working with our sponsor. With the guide having been provided, both the team and our sponsor felt confident that the exhibition could be completed at the standard that they required.

FINDINGS

CREATION OF A CLIMATE CHANGE EXHIBITION

Throughout this project, we determined that the climate change exhibition from 2016 was very outdated and included information that was incorrect in the present day. Through interviews with the lead artist and designer, extensive archival research, and intensive discussions with our focus group, our team was able to create a polished exhibition that relays the current information effectively and efficiently. We were able to leave our sponsor with an exhibition capable of being displayed on multiple mediums, from the National Museum of Namibia to schools in locations around the country, but most importantly virtually on the internet. With a virtual option that is interactive and informative firmly in place, we are confident that the exhibition can be used for years to come.

Original Exhibit Contained Abundant and Messy Information

From our interview and our focus groups, the team determined that all of the panels contained too many words. At times, the text would take up a majority of the panel and be sometimes made too small to read in an attempt to fit more information. Panel by panel, we asked Mr. Werner what sections needed the most work and decided on larger portions that could be reduced in size or cut out entirely. We found that there were many instances of information that did not have any relation to the main idea of the panels, or information that was redundant and could be removed.

On the bottom of each panel was a large white section called the 'mini dictionary' or 'fun fact' that was thought to take up too much space and contained too much information. As a part of each panel, we thought that it was very obtrusive and often distracted from the more important information and artwork. Mr. Werner and our team decided to try and minimize the size of this section and present the information in a more concise format. We discussed moving these definitions and facts into the booklet, however, this idea was later discouraged by our focus group. The focus group felt that each panel should be standalone, so the bottom mini dictionary remained on each panel. Most of the definitions were chosen to remain because they were important and added context to the panel, but a select few were able to be removed.

The other problem presented by these sections was that they contained the logo of each sponsor of the exhibition. At the time, we were unsure which of the sponsors were still involved with the project and if it was acceptable for the logos to be removed from the bottom as well. We found from our focus group that we should keep the sponsor logos on each panel due to agreements made with each sponsor in case the panels needed to.

It was decided to keep the logos where they were but try to find a way to make them blend in with the panels so that the white section could be shrunk or removed. When reviewing the climate change booklet, we found it to be very clear and concise, a very different finding compared to the climate change panels. The booklet followed a clear path and the information was presented neatly.

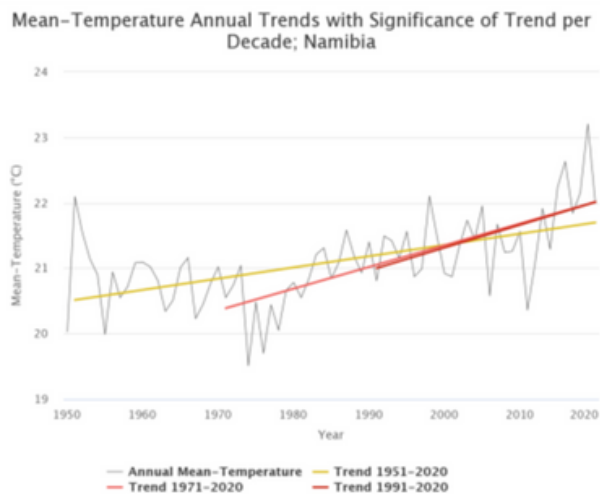
Original Exhibition Was Outdated

Mr. Werner also expressed many of the concerns that he had about the overall look of the panels. He explained that he felt rushed when creating the original exhibition and some of his artwork was not as finished as he would have liked it to be. Some of the ideas that he had initially did not make the final version of the exhibition because he was pressed for time. This time around, he wanted to take his time in drawing the artwork and we were more than willing to allow him that time. Some of the photographs on the original panels were deemed to be unnecessary or outdated as well. To add a more personal touch to the exhibition and to ease the process of finding citations, Mr. Werner suggested that we as a team take photographs in Namibia that could be used to replace some of the old ones. These photographs were to have relevance to the panels and help to demonstrate climate change in Namibia. We also thought that it would provide a more personal connection to the audience if they could see how climate change was affecting their country.

The most pressing concern expressed by Mr. Werner was, of course, the statistics and data that had not been updated since 2016. Seven years later, many obvious changes had to be made to almost every panel. He suggested that we go through each panel and anywhere that mentioned some sort of statistic be looked at and researched to find something more up-to-date. Beyond that, Mr. Werner expressed his concerns about the graphs from the original panels. He felt that some were confusing to look at and difficult to understand, while others were simply unappealing to the eye. He entrusted us to find graphs that were more relevant to the panels, and easier to understand and asked us to make them simply better looking so that they would look natural on each panel. With a deeper understanding of what was expected to be changed on each panel, we immediately began our archival research for everything we needed to change.

We also found that the exhibit's climate change booklet was out of date, containing information from 2016 that was now considered inaccurate and untrue. Mr. Werner explained in our unstructured interview that the booklet was quickly constructed after the completion of the original exhibit in 2016. We found that the booklet's initial purpose was to be a stand-alone product, allowing individuals to gain a more complex understanding of climate change that the original exhibition could not give. We found that making the booklet more compatible with the exhibit would allow for a better connection.

Figure 12



(World Bank Climate Change Knowledge Portal, n.d.)

Limited Access to Climate Change Data

Throughout this project, we completed a significant amount of research related to climate change trends in Namibia and relevant mitigation policies. We used various government databases, such as the world bank and the UN climate change knowledge portal, to find projected data for temperature, precipitation, and the economy.

We found that most of the readily available data were not published by the Namibian government but rather by larger organizations such as the UN and its departments. The Namibian government did publish the updated National Determined Contribution (NDC) from 2021 which did include some valuable data related to mitigation policies. However, we found it very challenging to find up-to-date statistics regarding agricultural land usage. The only available data regarding land usage was split up into 4 books that we had to borrow from the Namibian Ministry of Agriculture, Water, and Land Reform. These books still did not include any relevant information for our project's purposes and were all somewhat outdated with information from 2016-2018.

From our research, we found several trends demonstrating climate change is present and affecting Namibia. Over the past 30 years, the mean temperature in Namibia has followed an upwards progression which can become catastrophic for the country (World Bank Climate Change Knowledge Portal, n.d.). As an arid environment, Namibia is at a higher risk of droughts and floods which are made worse by climate change. The desertification process is also expected to worsen causing farming lands to shrink, and crop failure to become more common (Climate Change Manifestation into Drought - Namibia | ReliefWeb, 2019). It was also found that Namibia's population has continued to increase and is expected to hit 4.73 million by 2080, which is a 2.16 million increase from 2023 (Namibia Population 2023 (Live), 2023). With a continually increasing population, more land is required for agriculture and small stock farms will take up more land to support the increasing population. By 2080, it is expected small stock farms will take up 41.31 % of the total land of Namibia (Mendelsohn, n.d.).

Initiatives in Namibia to Educate and Mitigate the Effects of Climate Change

There are several initiatives throughout Namibia that have a goal of reducing carbon dioxide equivalent emissions and adapting to climate change. Renewable energy has become more common in Namibia, with a wind farm in Luderitz and a new green hydrogen project that has growing support and consideration. The company, Ohlthaver and List Group has implemented the bush to energy project, which removes invasive bushes on cattle farms and converts them to heat energy. This project has allowed cattle grazelands to thrive while creating energy at the same time.

Figure 13



Note: (Hp.Baumeler, 2019) Neckartal Dam

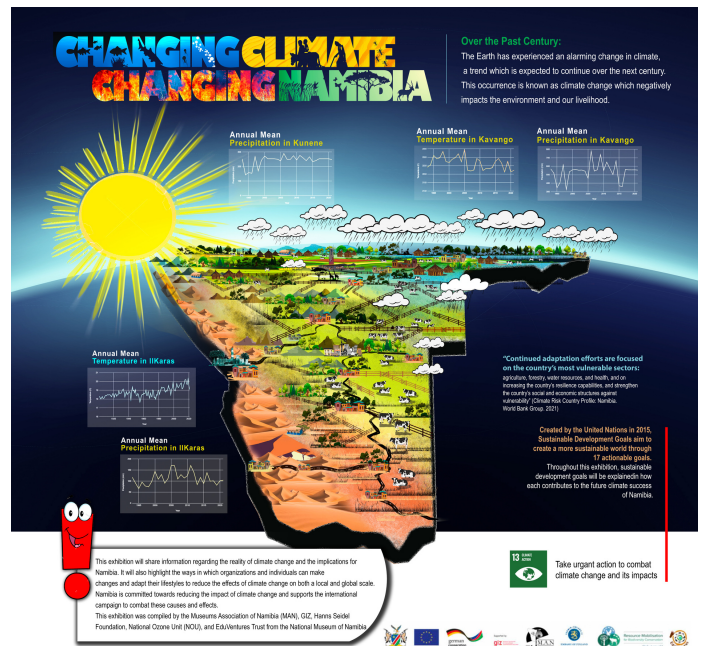
The F4R project is another initiative created by GIZ and the Ministry of Agriculture, Water, and Land Reform. The goal of the project is to allow smaller farmers to become more resilient to droughts and become more effective together (GIZ, 2021). The Neckartal Dam follows a similar idea, storing water with the sole purpose of irrigating high-value crops and accelerating the process (Namibia - Agricultural Sector, 2022). However, the Neckartal Dam has not begun the irrigation process for government approval has not been met.

Namibia's government has adopted various policies to reduce its carbon footprint and greenhouse gas emissions. Namibia has joined the climate promise in their 2021 NDC that by 2030 they will reduce their total emissions by at least 91% (UNDP Climate Promise, 2021). Namibia has also signed the Paris Agreement, an international treaty on climate mitigation. The National Environmental Education and Education for Sustainable Development policy has the goal of emphasizing the importance of sustainability and fostering the idea of a dynamic balance between the environment and the socio-economic advancement of Namibia (National Environmental Education and Education for Sustainable Development Policy 2019)

The Finalized Panel Designs

Overall, compared to the original panels, we edited the text for conciseness, spelling, and grammar, as well as updated facts and statistics. We also updated the layouts and illustrations of the panels to be more focused in their presentation. Many of the hand-drawn components were replaced with computer-drawn components that better suited a more professional feel to the panels.

Panel 1



For panel 1, we replaced the graphs with new year-by-year data vs the monthly mean data since we found that it better shows how the climate is not constant. We also changed the locations that the graphs were from since we could not find data for cities on an annual basis. We decided to remove the food for thought section from the panel since it was out of place. We edited the text for conciseness and updated quotes. We also removed the rainfall legend from the illustrations as it was unclear what the legend meant to the illustration.

Panel 2

My Home the blue planet

THE ATMOSPHERE

What happened to Mars?
Mars is the 2nd closest planet to the Sun. It has the same size and distance from the Sun as Earth. But it is very dry. The atmosphere is very thin. It is composed of 95% carbon dioxide and very little oxygen and nitrogen. The surface temperature is very low. It is about -60°C. The planet has lost its atmosphere and water. It is now a dry, cold planet.

What happened to Venus?
Venus is the 3rd closest planet to the Sun. It has the same size and distance from the Sun as Earth. But it is very hot. The atmosphere is very thick. It is composed of 96% carbon dioxide and very little oxygen and nitrogen. The surface temperature is very high. It is about 460°C. The planet has lost its water. It is now a hot, dry planet.

The Atmosphere: A Blanket and A Shield
The atmosphere is a blanket and a shield. It keeps the Earth warm and protects us from harmful ultraviolet (UV) radiation. It is made up of four layers: the Troposphere, Stratosphere, Mesosphere, and Thermosphere. The ozone layer is in the Stratosphere. It is made up of 3 oxygen atoms (O₃). It absorbs most of the UV radiation from the Sun. Without the ozone layer, life on Earth would not be possible.

The Earth is the only planet in our solar system that is known to contain a diversity of life forms. Earth is also the only planet we know of so far, that has the right mass, chemical composition, and location to support water in liquid form. A total of 77% of the Earth's surface is covered with water, which makes it appear blue when viewed from space. It is for this reason that Earth is called the Blue Planet.

Only the first seven km of atmosphere can support life. Pilots flying above 5 km are required to have a pressurized cabin and/or carry oxygen.

Source: Embiar

My Home the blue planet

THE ATMOSPHERE

The Atmosphere: A Blanket and A Shield
The atmosphere is composed of 4 layers and extends to a total of at least 640 km above the Earth. The ozone layer, which acts as a security blanket to protect us from harmful ultraviolet (UV) radiation, can be found within these layers. If large amounts of UV radiation penetrate the Earth ozone layer depletion will occur. The atmosphere plays a vital role in making planet Earth habitable.

The Earth is the only planet in our solar system that is known to contain a diversity of life forms. Earth is also the only planet we know of so far, that has the right mass, chemical composition, and location to support water in liquid form. A total of 77% of the Earth's surface is covered with water, which makes it appear blue when viewed from space. It is for this reason that Earth is called the Blue Planet.

Only the first seven km of atmosphere can support life. Pilots flying above 5 km are required to have a pressurized cabin and/or carry oxygen.

Source: Embiar

Did you know?
The atmosphere is a blanket and a shield. It keeps the Earth warm and protects us from harmful ultraviolet (UV) radiation. It is made up of four layers: the Troposphere, Stratosphere, Mesosphere, and Thermosphere. The ozone layer is in the Stratosphere. It is made up of 3 oxygen atoms (O₃). It absorbs most of the UV radiation from the Sun. Without the ozone layer, life on Earth would not be possible.

MINI DICTIONARY

Ozone layer: a layer found in the Stratosphere, containing high concentrations of Ozone (O₃). Ozone is made up of 3 oxygen atoms.

Ozone layer depletion: the reduction of the amount of ozone in the stratosphere.

Ultraviolet (UV) radiation: rays from the sun which can cause sun burn, cataracts in peoples' eyes and skin cancer.

Solar system: consists of the Sun as well as the eight planets; Jupiter, Saturn, Uranus, Earth, Venus, Mars and Mercury.

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Ultraviolet (UV) radiation: rays from the sun which can cause sun burn, cataracts in peoples' eyes and skin cancer.

Solar system: consists of the Sun as well as the eight planets; Jupiter, Saturn, Uranus, Earth, Venus, Mars and Mercury.

On panel 2, we focused the panel on the apple-orange earth analogy emphasizing how little space we have to live on Earth. We decided to remove the text related to Venus and Mars since it did not contribute to the focus of this section of the presentation. Venus and Mars in the context of this presentation, are still on the presentation as a reference point to other places in the solar system where we cannot live, showing how unique Earth is. We also decided to remove the sections related to the atmosphere since it is better explained and more relevant to the next panel.

Panel 3

CAUSES OF CLIMATE CHANGE

Climate change refers to a change in average weather conditions over a long period of time. Climate change is a natural phenomenon but is increasingly being driven by the release of carbon dioxide and other 'greenhouse gases' into the atmosphere.

Natural Causes of Climate Change:
Volcanic activity, solar activity and the Earth's orbit around the sun are all natural factors that contribute to climate change. These causes of climate change are not under human control.

Ozone hole: A hole in the ozone layer was discovered over Antarctica in 1985, which allowed large amounts of UV radiation to penetrate the earth. Pacific plants are covered from when the ozone hole is formed by the solar radiation near reaching the Earth's surface where it causes health problems from eye damage to skin cancer. The ozone hole, however, is not the mechanism of global warming.

Human activity:
The burning of fossil fuels (oil, coal, and gas) has increased the amount of greenhouse gases in the atmosphere. This is the main cause of global warming. Other human activities that contribute to climate change include deforestation and land use changes.

Did you know?
We discovered the Ozone hole, in Climate Change Year! Both of these environmental problems do, however, have a common cause—human activities. The hole caused by depleted amounts of ozone in the atmosphere. The hole is caused by chemical sprays of ozone-depleting substances. The hole is caused by chemical sprays of ozone-depleting substances. The hole is caused by chemical sprays of ozone-depleting substances. The hole is caused by chemical sprays of ozone-depleting substances.

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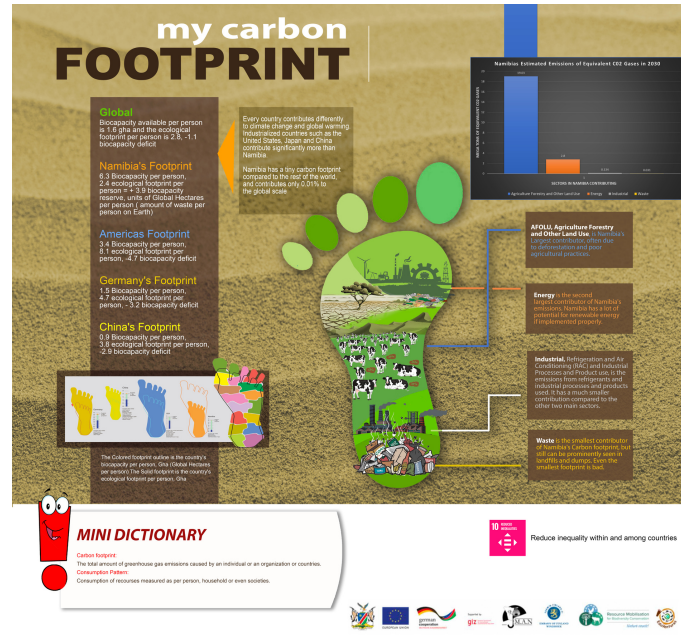
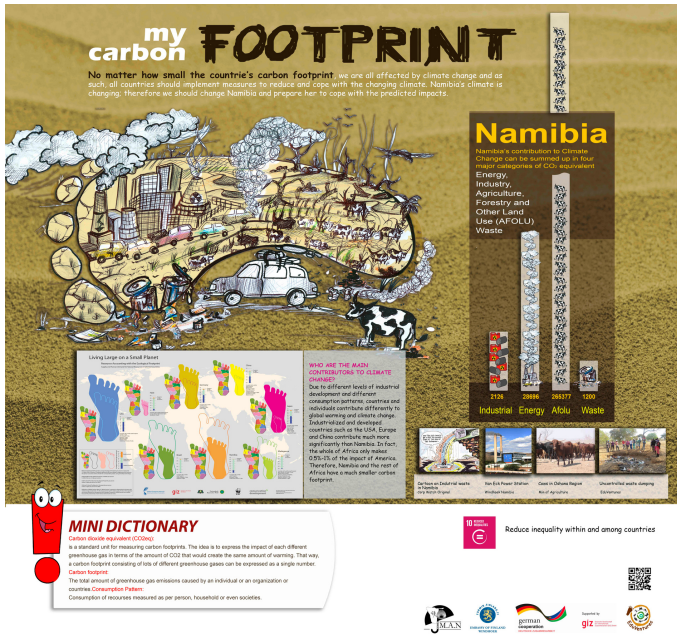
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FINDINGS: CREATION OF A CLIMATE CHANGE EXHIBITION

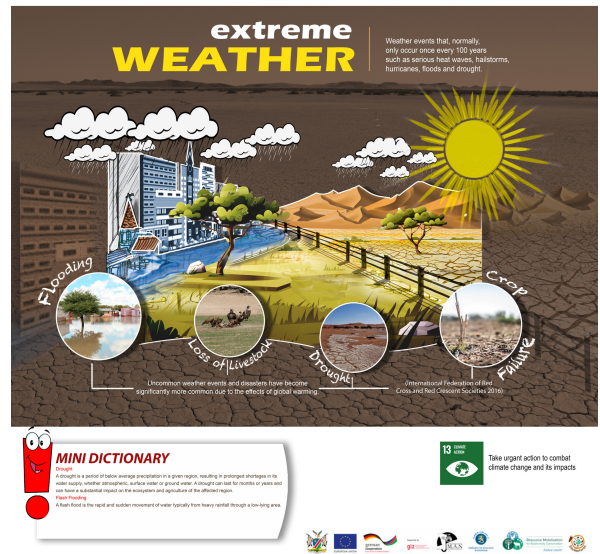
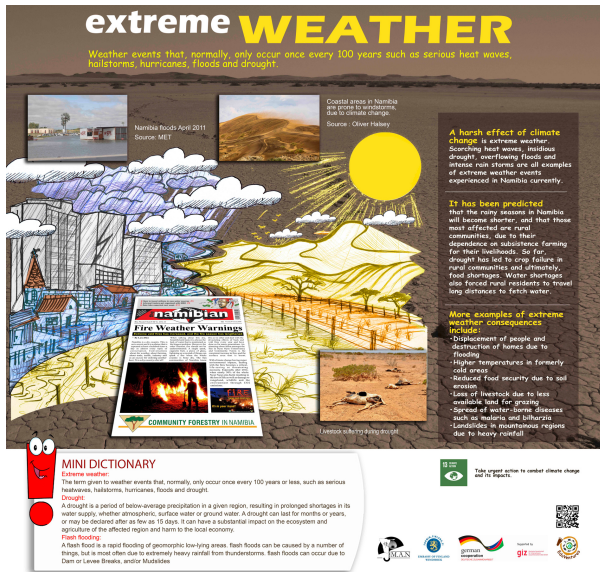
On panel 3 we removed the graph on the bottom of the page as well as edited the text for conciseness. We decided to remove the graph from the panel since it did not contribute a message to the panel and was confusing to look at. The illustrations of this panel were also updated for more clarity, including the text bubbles to better flow into the background.

Panel 4



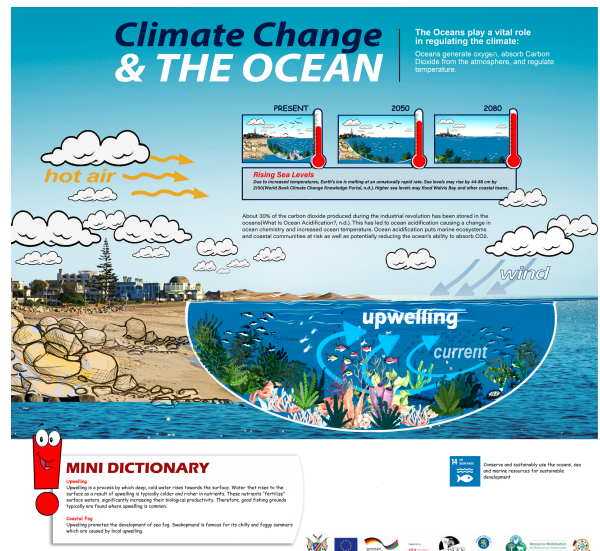
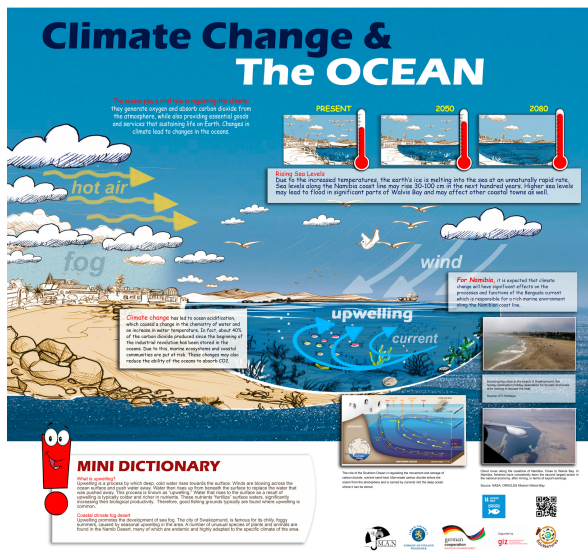
On panel 4 we updated the graphs and changed the illustrations of the panels. We updated the main foot to better relate to the text as well as creating a legend for the carbon footprint comparisons. The graph was also updated with new information and included units instead of just random numbers. A more in-depth description of each major contributor to carbon dioxide equivalent gasses was also explained allowing the viewer to better understand the graph.

Panel 5



On panel 5 we reduced the amount of text and used images to speak in place of them. We also redesigned the illustrations on this panel to be more focused on the pictures within the panels.

Panel 6



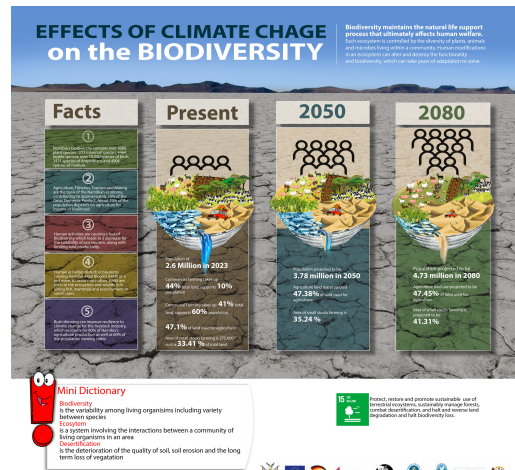
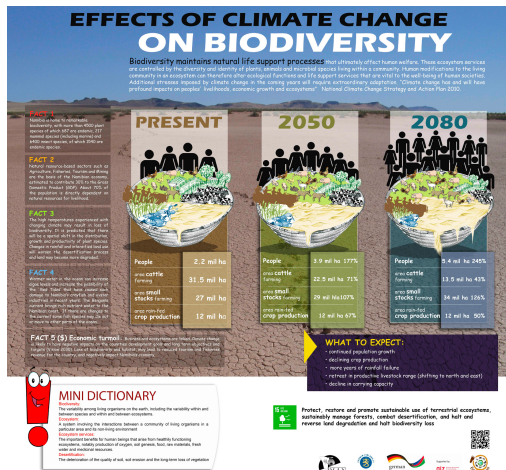
For panel 6 we updated the illustrations and removed redundant pictures and illustrations. The background image was updated to combine photography of Swakopmund with drawings of the Benguela current to make it more relatable and easy to understand. We also edited text for conciseness as well as removed nonsensical text.

Panel 7



On panel 7 we changed the initiatives and stories being talked about to new local ones in Windhoek. We thought it was important that these initiatives should be ones that someone could walk around the city and see in person. The drawing at the center of the panel was redone to more clearly show the city of Windhoek, as well as some of the ideas about how to make the city more green.

Panel 8



On panel 8 we updated the facts presented on the panel as well as the visuals. We decided to go from numbers to percentages since they are easier to understand. The graphs were also updated to reflect the new statistics we got. The baskets were redrawn to better represent the statistics in each column. Each fact was replaced with more relevant and accurate information as well.

Panel 9

The Road to Reducing our carbon footprint

In order to reduce our carbon footprint, we need to make mitigation efforts to reduce the greenhouse gas emissions that are warming our planet. One way that can be done is by using renewable energy sources instead of burning fossil fuels, such as petrol, oil and coal. Another way we can reduce greenhouse gas emissions is by planting more trees.

Bush to Energy
The Namibian Renewable Energy Association (NREA) is a non-profit organization that promotes the use of renewable energy in Namibia. It provides information and support to individuals and businesses interested in renewable energy. NREA also advocates for the development of a renewable energy sector in Namibia.

According to experts,
Renewable energy is becoming increasingly important as a source of clean energy. It is a sustainable and reliable source of energy that can help reduce greenhouse gas emissions and combat climate change.

Wind energy uses the wind through wind turbines to generate electricity. Wind energy is a clean and renewable source of energy that can help reduce greenhouse gas emissions and combat climate change.

Solar energy is generated by solar panels that convert sunlight into electricity. Solar energy is a clean and renewable source of energy that can help reduce greenhouse gas emissions and combat climate change.

Young people have the potential to make great change. How to do this depends on the influence we have on people and institutions. Climate Change is very much a young person's issue. We are all part of the solution. We can all do our part to bring about a better world for ourselves and for future generations. Every young person has some sort of way to make change in society. We find interesting ways to get on how young people of their age together can build a sustainable future in terms of change.

Mini Dictionary
Mitigation: Efforts to reduce or prevent the release of greenhouse gases by, for example, using renewable energy instead of fossil fuels, such as wind and solar.
Renewable energy: Energy that is generated from renewable resources, which are naturally replenished on a human timescale, such as sunlight, wind, rain, tides, waves, and geothermal heat. Renewable energy often provides energy in four different ways: electricity generation, heating, transportation, and rural (off-grid) energy services.
Energy efficiency: is the goal to reduce the amount of energy required to provide products and services. For example, insulating a home allows a building to use less heating and cooling energy to achieve and maintain a comfortable temperature. Installing fluorescent lights, LED lights or natural daylight reduces the amount of energy required to obtain the same level of illumination compared with using traditional incandescent light bulbs.

Enter access to affordable, reliable, sustainable and modern energy for all

The Road to Reducing our CARBON FOOTPRINT

To reduce our carbon footprint, we need to make mitigation efforts to reduce greenhouse gas emissions. Renewable energy is a great alternative to burning fossil fuels that release these greenhouse gases.

Hydro Power:
Hydro power is a clean and reliable source of energy. It is generated by the flow of water through turbines, which convert the kinetic energy of the water into electricity. Hydro power is a renewable source of energy that can help reduce greenhouse gas emissions and combat climate change.

Wind Energy:
Wind energy is a clean and renewable source of energy. It is generated by wind turbines that convert the kinetic energy of the wind into electricity. Wind energy is a renewable source of energy that can help reduce greenhouse gas emissions and combat climate change.

Renewable Energy in Namibia:
Namibia has a large potential for renewable energy. The country has abundant wind, solar, and hydro resources. The government is committed to developing a renewable energy sector in Namibia. This will help reduce greenhouse gas emissions and combat climate change.

Green Hydrogen:
Green hydrogen is a clean and renewable source of energy. It is produced by using renewable energy to split water into hydrogen and oxygen. Green hydrogen can be used as a clean fuel for transport, industry, and power generation. It is a promising technology that can help reduce greenhouse gas emissions and combat climate change.

Solar Energy:
Solar energy is a clean and renewable source of energy. It is generated by solar panels that convert sunlight into electricity. Solar energy is a renewable source of energy that can help reduce greenhouse gas emissions and combat climate change.

Bush to Energy:
The Namibian Renewable Energy Association (NREA) is a non-profit organization that promotes the use of renewable energy in Namibia. It provides information and support to individuals and businesses interested in renewable energy. NREA also advocates for the development of a renewable energy sector in Namibia.

Wave Power:
Wave power is a clean and renewable source of energy. It is generated by the movement of waves in the ocean. Wave power is a renewable source of energy that can help reduce greenhouse gas emissions and combat climate change.

Younger Generations:
Younger generations have the potential to make great change. How to do this depends on the influence we have on people and institutions. Climate Change is very much a young person's issue. We are all part of the solution. We can all do our part to bring about a better world for ourselves and for future generations. Every young person has some sort of way to make change in society. We find interesting ways to get on how young people of their age together can build a sustainable future in terms of change.

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Share access to affordable, reliable, sustainable and modern energy for all

For panel 9 we updated the text for conciseness as well as added new potential ways of creating renewable energy. For this, we didn't want to promote potential initiatives unless they were already up and running. We focused on how the technology worked in a broad sense and how it could be applied to Namibia. Potential projects were also added demonstrating the potential energy that could be harvested in Namibian and informing the public of these projects.

Panel 10

Coping with Climate Challenge

Adapting agriculture and integrated water resource management

The majority of our population depends on agriculture as the basis of their daily income. The main activity in the northern regions is subsistence agriculture, which is primarily rainfall. Crop production is the primary due to fertile soil and available rainfall patterns. Despite the crop losses that are already associated with climate change, very few small-scale farmers are applying climate-adapted cultivation methods.

The joined project **CueWaters** developed and implemented measures to support the national process towards an Integrated Water Resource Management Approach (IWRM). The aim was to give people reliable, long-term access to clean water, thus enhancing their livelihood and health and creating job opportunities. IWRM relies on protection, fair use and various types and qualities of water for different purposes.

Greenhouse

Fish Pond

Through

Mini Dictionary

Conservative agriculture
In conservative agriculture, crop production is done through tillage and based on three principles: soil is tilled, crop rotation is practiced and a variety of crops are planted to conserve soil together with vegetation or plant residues. This makes it possible to improve soil health and water retention.

In the conservation and adoption of climate for water on the whole, rain harvesting is not an option. Rainwater harvesting systems are implemented and used during regular water shortages and provide water and food to a drought. Rainwater harvesting is regular and small-scale practices that are self-sufficient to increase food security.

COPING WITH CLIMATE CHANGE

Adapting agriculture and integrated water resource management

Farming for Resilience (F4R) initiative

Storage Tank

Greenhouse

Roof Catchment

Fish Pond

Through

The green scheme

82 small scale farmers

The Neckartal Dam

577 Million cubic liter of water

Majority of the Population

Conservative Agriculture

Rainwater Harvesting

Mini Dictionary

Conservative agriculture is a method used to adapt to climate change that relies on crop rotation and constant coverage of soil by vegetation.

Rainwater Harvesting is accumulation of rain water to be reused for farms and allows for better efficiency when drought occurs.

For panel 10 we updated the initiatives relating to farming and agriculture to more recent ones that people could see the impacts of. We also edited the text for conciseness as well as updated the illustrations to be more visually appealing. We included new initiatives found in Namibia and made the background brighter, allowing for the text to be more readable.

Panel 11

Agenda for the Meeting

MEETING THE CHALLENGE

HOW CAN WE BEST EDUCATE NAMIBIANS ABOUT ENVIRONMENTAL CHANGES?

HOW CAN WE MAKE OUR BUILDINGS MORE GREEN?

HOW WILL THE ENVIRONMENT HELP SUSTAIN LIVES?

HOW CAN BUSINESS AND BANKS ADAPT SUSTAINABLE DEVELOPMENT AGENDAS?

WHERE DOES HEALTH AND HYGIENE FIT IN THE PICTURE?

HOW DOES GAP AND SDG IMPROVE MY LIVELIHOOD?

HOW CAN I BEST TEACH SCHOOL LEARNERS ABOUT CLIMATE IN AN ENGAGING AND RESPONSIBLE MANNER?

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Agenda for the Meeting

Implementing SDG and GAP

How can we all work together for the benefit of the entire society?

What can we learn from societies' communities? Clear and well developed communication channels? SDG and GAP?

Sustainable Development priorities

1. Human well being
2. Economic development
3. Environmental protection

Achieving the goals

On September 20th 2015, countries developed a set of 17 global goals to pursue the sustainable development agenda. Each goal has targets to be achieved over the next 15 years.

As the goals have evolved, cooperation needs to be fostered between the private sector, civil society and people the poor.

Agenda for the Meeting

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Agenda for the Meeting

Implementing SDG and GAP

How can we all work together for the betterment of society?

What can we learn from Society?

Sustainable Development Priorities

1. Human Well being
2. Economic Development
3. Environmental Protection

Achieving the goals

Every profession plays a key role and must work together in order to lead the climate change challenge. Namibia has joined with the rest of the world in working to fight climate change and pursue the betterment of human well being.

Strengthen the means of implementation and mobilize the global partnership for sustainable development.

FINDINGS: CREATION OF A CLIMATE CHANGE EXHIBITION

For Panel 11, the biggest problem that we identified was the handwritten text. While the idea originally was to give a more playful feel to the panel, we found that it was too difficult to read and did not make much sense considering that the panel had a more serious topic. The handwriting was replaced with regular text and the bubbles were made more orderly to reduce confusion. The SDG boxes on the bottom also caught our eye because they were different sizes and stood out unnecessarily. Simply changing the box sizes and text within them made them blend into the panel easier. Lastly, the decision was made to replace the 'Achieving the goals' text with a description of the Sustainable Development Goals because it felt more appropriate on a panel that details a need for cooperation.

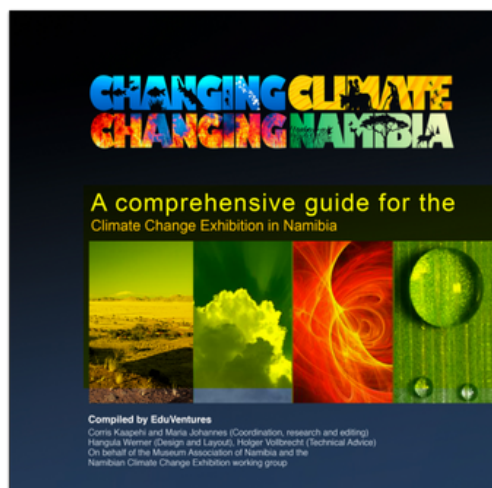
Panel 12



On Panel 12, the most obvious change to be made was the number of hands in Namibia. The population has changed since the panel was first created and needed to be updated. We also were made aware that many of the organizations, policies, and initiatives were too old. Many new examples have appeared since 2016 and we felt it was important to include newer, more prevalent examples. We also feel like the new web-like design helps to display the cooperation and widespread action that is taking place in Namibia.

The Creation of the Accompanying Booklet

A skeleton draft of the accompanying booklet was created containing new information that connected to the updated climate change exhibition. Each page contains newer images that allow the viewer to better understand the content. The text on each page is structured for easy maneuvering and will allow Mr. Werner to easily add an artistic touch.



The Virtual Implementation of the Climate Change Exhibit

The climate change panels were moved to a virtual platform where they could be accessed via the Internet. The virtual platform allows the user to have an interactive experience and retain the same information they would gain attending the physical exhibition. The virtual aspect has an audio option, allowing for Mr. Werner to present the panels as well, however, the audio files have yet to be delivered and will be uploaded at a later date. The finalized panels cannot be uploaded until the budget is amended, but a guide to uploading the panels was given to our sponsors. The guide continued a step-by-step path to running the virtual platform.

Summary

Our team successfully created a climate change exhibition with up-to-date statistics and graphics that will be presented to the general public to bolster climate change knowledge. Along with this exhibition, a skeleton draft of the accompanying climate change booklet was created, allowing for any finalized artistic touches to be added easily. The panels will be implemented on a virtual platform using a guide created by the team, allowing for more public access to climate change information.

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