Mission Folder: View Mission for 'Las Chicas de Puerto Rico'

State	Puerto Rico
Grade	6th
Mission Challenge	Environment
Method	Engineering Design Process
Students	broe9357 jkha9348 FHL129384756 LuzFigueroa

Team Collaboration

(1) Describe the plan your team used to complete your Mission Folder. Be sure to explain the role of each team member and how you shared and assigned responsibilities. Describe your team's process to ensure that assignments were completed on time and deadlines were met.

"Las Chicas de Puerto Rico" is a group of 6th-grade girls from Ramey Unit School in Aguadilla, Puerto Rico. The group's goal was to create an effective advisory system to alert people to respiratory issues of Saharan dust particles that are in the area. The plan to complete the Mission Folder was to have an organized system that each member felt was fair and doable. First, we appointed each member a job based on their strengths and interests. We then established a meeting schedule to share learned information, edit work, conduct experiments and meet with volunteers from the community. In addition to meeting during our Research Class on alternate days, we gathered every Tuesday and Wednesday from 3:00-4:00 PM. We also met during Seminar (study period) from 2:15-2:45 PM. These meeting sessions helped us stay organized and complete our work on time.

In order to make the work within the Mission Folder our best possible, we completed several editing stages. Our sponsor, classmates, and volunteers used rubrics for each folder and graded us on our quality of work. This method encouraged us to do our best. To make sure the deadlines were met, we first developed a Vision and Planning Board to attach ideas and completed work. We then created a Team Plan Chart and Task Calendar that presented the deadlines to ensure everything was completed on time. One successful method we used was to finish assignments a few days before the due date so we would have extra days to go over our work and receive feedback from peers and community members. We also organized team three-ringed binders that held the lessons, notes, essays, rubrics, pictures and copies of all important papers.

To keep our group organized and on track, it was important to establish Group Norms. These included: stay positive, stay on task, listen to other's opinions, and complete all assigned work. We encouraged each other by bringing in snacks to each meeting and keeping our attitudes enthusiastic. We also encouraged positive feedback with all ideas and set high standards for ourselves and our group. In addition, we invited help from community members who were interested in our topic: Commander Flip Capistrano from the US Air Station Borinquen, the Ramey Unit School Nurse, Ramey Unit School Teachers, and community members who struggle with respiratory issues. Our topic was very important for our community on a personal level and also based on our survey. Many people in our community have respiratory issues and would benefit if they knew the density of the Saharan dust as well as suggested daily activities in our area.

When creating a strategic team, we selected members whom we knew were interested in this mission and would take the work seriously. The following lists these students, their roles, and a description of their jobs. Luz Figueroa was the Manager and one of the Group Leaders. She was great at brainstorming possible solutions when we were stuck on our path. She also helped us look at the data we collected and found different ways to come up with solutions. She also generated ideas for our project when we needed inspiration. Furthermore, if we needed something done quickly and effectively, we could trust Luz. She was responsible and effective when it came to talking to specialists or community members.

Bria Roettger was the Time Keeper, Encourager, Spokesperson, and one of the Group Leaders. As the Timekeeper and Encourager, she made sure all the work was completed and provided help to the other group members when needed. She also helped remind the others about upcoming events. In addition, when a group member needed help researching our topic, she encouraged them to be positive and stay on task. As the Spokesperson, she helped deliver our group's conclusions about our research topic and communicated our ideas with other students. She checked the work of group members to ensure that they could explain how questions were answered and conclusions were made. As one of the Group Leaders, Bria kept the group on task at all times and helped everyone remember the due dates through e-mails and written notes. She also kept the team motivated with snacks during the meetings and reminded them of the importance of their project and the work they were creating as a team.

Also as a Spokesperson, Group Leader, and Editor, Janat Khan informed the group about the most recent research data. As a Recorder, she helped take good notes during the research class and always completed the work assigned to time so they could spend more time on other Ecybermission activities. In addition, she made sure everybody was up to date with the newest information by either discussing it in person or messaging through e-mail or social media. As Editor, she was the one to go to when we needed help with grammar or spelling. Considering she almost won the Ramey Unit School Spelling Bee, she was a very trustworthy editor!

As the team's Recorder, group leader and Organizer, Janeliz Guzman's strength was organizing all of our research papers in a three-ringed binder and made sure everybody was on task. She recorded answers from our surveys and discussed the outcomes of the group. Since she was elected Class Secretary, it made sense to choose her as our Recorder and Organizer. She was always on task and encouraged us to do our best work for example.

One main advantage that our team shared was being able to speak two languages. Three of us speak English and Spanish and one of us speaks Hindi and English. Communicating in English and Spanish helped us work effectively with others when conducting interviews and surveys in our community. Since the majority of the population speaks Spanish in Puerto Rico, it was important to understand and use this language in addition to English.

Overall, we are good friends who work well together. This mission of creating an effective tracking and warning system for Saharan dust is important to us and we are excited

to make a difference in our community.

Uploaded Files:

- [View] **Team Plan** (By: broe9357, 02/25/2016, .docx)
  This is a chart that briefly describes the tasks that needs to be completed on a specific date. This helped us organize the work that still needed to be completed, which would be helping us manage our work and finish it on our due date.
- [View] **Group Tasks** (By: broe9357, 02/27/2016, .docx)
  This form lists the group roles that were created along with a description of each duty and who completed them. We chose these tasks based on the strengths of each individual. We first decided to make each student the group leader and manager because each participant Of "Las Chicas De Puerto Rico" worked to their full potential as though a leader would.
- [View] **Group Working Img.** (By: broe9357, 02/28/2016, .JPG)
  In this image taken, it shows us working on our project, editing, and publishing our website.
- [View] **Team Working** (By: broe9357, 02/28/2016, .JPG)
  In this image,it also includes us working on our Ecybermission project
- [View] **Team Working** (By: broe9357, 02/28/2016, .JPG)
  This image includes Janeliz working on taking notes of the research completed.
- [View] **Group Photo** (By: broe9357, 02/28/2016, .jpg)
  Las Chicas de Puerto Rico

Engineering Design

Problem Statement

(1) What problem in your community did your team try to solve? Why is this problem important to your community?

The Saharan dust from Africa is affecting the environment and people worldwide including Puerto Rico. Fungi and other particulates are carried through this dust affecting people with respiratory issues who live in our community. One of the main health problems related to the exposure to Saharan particulates is that it may trigger asthma attacks. Therefore, our problem statement is, "How can we create an effective warning system about the Saharan dust for asthmatic sufferers in Puerto Rico?"

We first questioned why the effect of the Saharan dust has increased over time. This question helped us relate information to our Mission Challenge of Environment. Our idea relates to the changes that happened with the land of the Saharan Desert. This desert used to be a fertile farming land. Due to changing climate conditions and introduced pollutants, the Saharan Desert has evolved into a dry, dusty environment. As stated by NASA (National Aeronautic and Space Association), this dust is transported through the Trade Winds and travels about 7,000 miles to Puerto Rico carrying 60-200 million tons of dust a year. This problem may be triggering respiratory issues including asthma and affecting many people including those we know. We predict that there is a correlation between increases in the amount of Saharan dust with an increase in the amount of asthma attacks in our local areas that are exposed to the Saharan dust. Photographs have been taken in San Juan, Puerto Rico showing the Saharan Dust in the area. There are also other dangers that are related to this dust. NASA also supports in their Earth Observatory website, that the Saharan dust can hold a fungus called Aspergillus sydowii. This fungus falls into the Caribbean Sea and causes the Sea Fan Disease to infect this coral reefs. From this research, it is clear that our selected problem of the impact of Saharan dust closely relates to the Mission Challenge of Environment.

This problem is urgent in our community because there are many people who are diagnosed with asthma and respiratory issues in Puerto Rico. Many of the people that we know who are diagnosed with asthma are usually friends and family members. For example, Bria's brother is diagnosed with asthma, and he experienced an attack after running on a day that had high levels of Saharan dust in the area. Luz's brother also suffers from asthma attacks. His family later found out that his asthma was at a serious level and he needed the proper therapy to get back to normal. Both cases went to the hospital and were advised to stay indoors because of high levels of Saharan dust in our area. If there is a possible correlation between asthma and the Saharan dust, why don't asthmatics have access to know the level of dust in the area to prepare for possible attacks? If we create an effective warning system to alert people about the levels of Saharan dust, then asthmatic sufferers may be better prepared to prevent future attacks.

(2) List at least 10 resources you used to complete your research (e.g., websites, professional journals, periodicals, subject matter experts).

The following resources were used in our research. This research ranged from websites to subject matter experts and community members. For a detailed bibliography, please refer to the bibliography attachment.

Websites:

1. http://www.theguardian.com/world/2009/sep/27/dust-storms-diseases-sydney

2. http://wwwhttp://tropic.ssec.wisc.edu/real-time/salmain.php?prod=splitEW

3. http://telegraph.co.uk/news/earth/environment/10739019/Sahara-dust-storm-prompts-serious-health-warning-for-asthmatics.html

4. http://response.restoration.noaa.gov/about/media/what-does-sahara-desert-have-do-hurricanes.html

5. http://www.weather.com/science/weather-explainers/news/saharan-dust-africa-caribbean-gulf-of- mexico

6. http://www.conservationinstitute.org/interesting-sahara-desert-facts/

7. http://coastal.er.usgs.gov/african_dust/

8. http://earthobservatory.nasa.gov/NaturalHazards/view.php?id=83966

9. http://www.telegraph.co.uk/news/earth/environment/10740827/Saharan-dust-and-pollution-confusion-over-health-risk-from-smog-cloud.html

10. http://thesaharadesertisonfire.blogspot.com/2012/11/current-human-impacts.html

11. www.earthobservatory.nasa.gov

Subject Matter Experts and Community Members:

12. ctepley@naic.edu (Dr. Craig Tepley, Air Quality Specialist)

13. Air Station Employees: Commander Flip Capistrano, Chaplain Nathan Rice

14. Ramey Unit School (DoDEA) Teachers: Mr. Herald Roettger (Science), Mr. Victor Rivera (Technology), Ms. Nelida Rivera (Technology), Dr. ReGester (Technology)

15. Ramey Unit School (DoDEA) Administration: Mr. Kennith Kirk (Principal), Ms. Thelberstine Barbee (Vice Principal), Ms. Elizabeth Escobar (School Nurse)

We worked with Dr. Teply, an Air Quality Specialist through E-mail. He gave us a brief view of the impact of Saharan dust around Puerto Rico. We also worked with Commander Capistrano, who is the Executive Officer at the US Air Station Borinquen in Aguadilla, Puerto Rico. He informed us that Coast Guard pilots would use our website. These employees would like to know when skies are clear or if Sahara dust is present. This is helpful when preparing for flight and search and rescue missions. The Science and Computer Teachers at Ramey Unit School also helped us a lot in terms of making our website better and informing us of the impact of the Sahara dust in our community. In addition, the Computer Apps Teacher helped us with our website by teaching us the basics of programming and editing.

(3) Describe what you learned in your research.

In our research, we learned many things about the Sahara Desert and how it affects our lives. One of the main points we learned through our research is the possible correlation of asthma and respiratory issues with the Saharan dust. The air pollution in Africa has increased overtime due to its history of having fertile land and now having mainly sand and dust in its place. The transportation of this dust trough the Trade Winds has affected Puerto Rico. This problem has not only been affecting our community, but also the Caribbean Sea's coral reef with fungi. According to NASA, this dust has created toxic algae blooming through the Gulf of Mexico and Florida which may also cause acid rain due to all the diseases and pollution it carries. The dust also carries a foot and mouth disease in areas in Japan and Korea. These problems have been reported since the 1970s. Though this problem has been ongoing, it is only getting worse and threatening those with respiratory health issues. Photographs were taken through satellites provides information that dust coming from Northern Africa through the Trade Winds towards areas such as the Caribbean Islands travel about 7,000 miles. The Saharan dust plays a negative impact on hurricane formation in waters such as the Atlantic Ocean, Gulf of Mexico, and Eastern Pacific Ocean. Though the Saharan dust seems to be a problem to people, is has helped fertilize the Amazon Forest. Nearly 40 million tons of Saharan Dust is being transported to the Amazon Forest each year. This is helping the Amazon with creating a healthier place for more fertile place. Though the Saharan Dust has been helping the rain forests in several ways, it also has been affecting them in negative ways. The dust is found on the leaves of trees in the Amazon Rain Forest which is making them dehydrate and damaging the photosynthesis process.

In addition to environmental and health concerns, the Saharan dust creates a security concern as well. Commander Capistrano from the US Air Station Borinquen explained that the dust could affect the performance of the airplanes and helicopters. It also could affect navigation is the skies are hazy with dust.

Overall, we learned that the Saharan dust is not only a major concern globally, but to our community in Aguadilla, Puerto Rico as well. People may benefit from learning about this dust and how it may affect their lives.

Experimental Design

(4) Develop a design statement. Be sure to describe what exactly your device should be able to do. Do not describe HOW it's going to do what it needs to do.

"Las Chicas de Puerto Rico" decided to create a website that effectively informs and advises people about upcoming dust levels generated from the Saharan Desert. This design will provide people with an early warning system about the Sahara dust levels. For example, if the dust is mild, we will update the website with the latest data in both English and Spanish. We will also create a part where it states tips about what people should do that day/week based on personal respiratory issues. Based on the asthma levels of the viewer, (mild, average, or severe) the website will provide useful tips. For example, this tool could inform people to stay inside if their level of asthma or respiratory issue is extremely delicate. This website is not limited to asthmatics or people with other respiratory issues; it may be available to people who would like to know if the air will be filled with dust since it carries several fungi and diseases. After working with Commander Capistrano from the US Air Station Borinquen, this tool would also be useful for pilots to use while conducting search and rescue missions.

(5) Determine the criteria for a successful solution and identify constraints for your design. Discuss what the device must have in order to accomplish its job and the restrictions of the device (i.e. the size, the cost, the weight, etc.).

We created a Saharan Dust Warning System Website (www.saharadustwarning.com) as our experiment and final product. This design targets, but is not limited to, asthmatics and those with repository issues. It will inform this population about the current levels of the Sahara dust and other particles including pollution and pollen in the area that may affect asthmatics. We hope this system will successfully decrease the amount of asthma attacks throughout Puerto Rico. This bilingual website is programmed to function successfully and be available for all users in English or Spanish. It consists of five tabs on the top (Home, About, Dust Update, Contact, and Other Issues) which specifically meets the needs of all visitors. The "Home Page" consists of a daily forecast about the Saharan dust impact. You will also find additional information describing the levels for the map down below which shows the current image from the NASA satellite showing the current Saharan dust impact. Once the user goes to "about", it includes a paragraph that is entitled "About Us". This introduces our mission to the user and reasons why this website was created. Once you go to the "Contact" page you will find all the resources we have used in our research and includes a feedback survey questioning the effectiveness of our website. Finally, it includes an informational YouTube video telling the users about the Saharan dust and a slideshows consisting of photos of the Saharan dust.

(6) Identify the relevant variables you will use to test your prototype or model and explain how you will measure your variables.

We used the Engineering Design Process to make sure our product was working effectively. This process involved various tasks. In our approach, we included surveying the users of our website to discover if our informational website and database were useful in their lives. If the data from our surveys informs us that our website was effective that would be one way to determine that our product is useful to people who live in Puerto Rico.

Independent variable: The independent variable was the created website that we would update every morning informing each user of the Saharan dust impact. This allows the viewer to make an informed decision about their physical activity for that day.

Dependent variable: This would be the knowledge gained after viewing the website. It would influence physical activity for each day depending on the level of Saharan dust in the area.

Control variable: The control variable would be people that did not view our website. These people would continue with their regular routine while the Sahara dust was present.

Constant variable: This variable would include where the people live in our community and life style besides the daily exercise.

These variables are measured through the survey posted on the website. The questions on our survey include their opinions of the usefulness our website.

Build Prototype or Model

(7) Develop a design and list the materials you used in your design. Include technologies you used (e.g., scientific equipment, internet resources, computer programs, multimedia, etc.).

Our prototype, Sahara Dust Warning System, used several materials to meet the needs of our community. First, we used a design statement to help us create our prototype. Next, we used a website software program to create, edit, and publish our informational website. After much research, we decided to use weebly.com for this purpose. This software program helped us create and produce a strong product. One resource who helped us was our Computer Technology Teacher who teaches Computer Programming to grades 6th through 12th. He helped us edit our website in terms of appearance and making it more "user-friendly". He also supported us with several tips that helped us create the best work that we could accomplish to reach the criteria. We also received support from some of our fellow peers in our Research Class that have interests in technology and outstanding understanding of computer problem and how to resolve issues. In addition, we used several other website resources that helped us improve our website. Examples of these websites included; www.ropic.ssec.wisc.edu, http://m.accuweather.com, and http://www.airnow.gov/. To create our first survey we used Google Forms. The graphs that were generated from this survey helped us determine that our website was effective at informing and warning people about the Saharan dust levels.

Our navigation system helps the user find the information they need. The first tab displays a map of satellite pictures that update automatically every three hours. This helped us inform users about how the dust levels will be in the day. From this information, our group used our knowledge to come up with the best prediction of what the dust levels will be that day along with appropriate activities. This information was manually imported daily by group members.

The following will list all the materials used in the design of our prototype:
1. Weebly software program
2. Internet resources: include the maps that were used and all resources linked
3. Online survey to receive feedback
4. Daily updated activity suggestions based on Saharan dust levels and respiratory issues
5. Storyboard
6. Google Forms

(8) Explain how you built your prototype(s) or model(s). Include each of the steps in your process.

To make our prototype, we followed steps to create a strong, accessible, and user-friendly warning system. First, we accessed a programming site named, www.weebly.com. This site provided software designs that helped with the programming and coding of our product.

Once we learned how to navigate the software, we then attached different icons to our website to provide a map for the visitor. These icons included: YouTube and a NASA satellite map that showed us the current Saharan dust impact that directed the user to each page.

Next, we spent some time to learn the software program so the programming and editing would not be so difficult. Once the members were able to understand and apply for the program, we created different login information so all members could all participate in the website to create pages, insert images, review text, and edit before publication.

Finally, we published our website with the link of www.saharadustwarning.com. We informed all students who completed our first survey about this link so they could access a tool that may help secure against possible asthma attacks in relation to the Saharan dust.

Test Prototype or Model

(9) Describe the data you collected and observed in your testing (use of data tables, charts, and/or graphs is encouraged).

After testing and analyzing our prototype, we added a feedback survey on our website to collect data from the users of the effectiveness of our warning product. We discovered several new data conclusions. We realized this information after reviewing the results from our survey that was attached through the website. One conclusion was our website was useful to all users. This is stated because the data collected reported that 88% of the users found it to be useful. In just a short amount of time, we had over 160 visitors. Another conclusion was that our Spanish translation needed to be more accurate. Finally, it was suggested that an app would be beneficial. Before we made our website, we originally planned to create an app, but after realizing the expense and limited time, we realized that we were better off making a website. With this feedback, we will try to make an app in the near future. Finally, through our research, we realized how bad the Saharan dust was in our local area. This was noted since we needed to update the results daily according to the updated maps that illustrated the density of the wind at a given time.

(10) Analyze the data you collected and observed in your testing. Does your data support or refute your design statement? Do not answer with yes or no. Explain your answer using 'Our data supports/refutes the design statement because...'

The following will state our design statement: The Sahara Dust Warning System Website will be a useful tool to advise people with respiratory issues about the current levels of Saharan dust in the community. Our data supports this statement because 88% of the people who took this survey reported that the Sahara Dust Warning System Website would be an effective tool to warn them of the current and upcoming Sahara dust levels. Therefore, the majority of the people that complete this survey said it was useful to them in relation to themselves, their family, or friends. Currently, more than 135 people have visited our website regularly. This confirmed that our website was applicable and trusted by many people who might have asthma or other respiratory issues. Survey feedback ranged from students to professionals. This feedback helped support our design statement with evidence that the website is a useful resource that has not been currently developed in our community.

(11) Explain any sources of error and how these could have affected your results

"Las Chicas de Puerto Rico" encountered both random and systematic sources of errors with our project. First, we were only able to publish our website a few weeks before the due date. This random error affected our results by receiving a limited amount of surveys in return. This small sample size added some uncertainty to the effectiveness of our website since more responses from the surveys may have affected the precision of the measurement. In addition, another random error included not effectively advertising our website through a stronger marketing campaign. Emails were sent out to all middle and high school students at Ramey Unit School requesting them to complete the survey relating the Sahara dust and respiratory issues. If students did not have these issues, they might not have answered the request. Therefore, a larger pool should have been identified to receive a stronger outcome. One systematic error our team encountered was the reliability of internet use for students at our school. Since our internet service provider is not reliable in our school and community, students experienced frustration while attempting to access our site. Many did not continue with the process due to this error. If the internet was reliable, more responses may be available to compare.

Drawing Conclusions

(12) Interpret and evaluate your results and write a conclusion statement that includes the following: Describe what you would do if you wanted to retest or further test your design. Evaluate the usefulness of your prototype or model. What changes would you make to your prototype or model for the future, if any?

When "Las Chicas de Puerto Rico" first started our experiment, we wanted to investigate what population would be interested in accessing our website. We sent out a survey to all middle and high school students at Ramey Unit School. We then asked students if they or someone they knew had asthma or respiratory issues and if they would have an interest in visiting our site. Once we identified those who were interested in our site with asthma or respiratory issues, we sent them our website link with a second survey. The survey asked if this population found the website useful for their needs. From this question, 88% responded that this website was effective to either their life or someone

they knew. Therefore, the results of our data helped us conclude that our website is effective to warn people with respiratory issues in regards to the Saharan dust.

If we wanted to retest our product, we would first create a more detailed survey asking more specific questions that would allow us to analyze the effectiveness of our product. The data would suggest that our website was effective to most users. If we were to redesign our product, we would convert our website into an app for smartphones which would be designed to subscribers of elevated Saharan dust levels along with suggested physical activities during this time-frame. We feel this would provide users with instant notification about the current air quality related to Saharan dust.

Uploaded Files:

- [View] **MLA** (By: broe9357, 02/25/2016, .docx)
  This is the MLA our version of all of the resources that we used. We used: http://www.easybib.com/ to put our websites in MLA format!
- [View] **Survey Results** (By: broe9357, 02/27/2016, .docx)
  This is the results that we got after publishing our Google forms survey to the 6th-12th grade students. We got a total of 41 responces with positive outcomes. Google froms created a graph for us showing the results.We also created a second survey asking the effectivness of our website.
- [View] **Sahara Dust survey** (By: broe9357, 02/27/2016, .docx)
  This survey was contributed to all middle and high schoolers (6th grade-12th grade). We got a total of 40 responses back with positive responses. The majority said that they would use our website.
- [View] **Feedback survey results** (By: broe9357, 02/27/2016, .docx)
  This pie chart shows one of the main questions that we asked in our feedback survey. It showed how the majority of the people using our website, thought it were useful to them.
- [View] **Website Statistics** (By: broe9357, 02/29/2016, .docx)
  This is the progression of our website views.

Community Benefit

(1) How could your design help solve your problem and benefit your community? Describe next steps for further research/design and how you have or how you could implement your solution in the future.

The Saharan Dust Warning System may help solve the problem of asthmatic triggers from the Saharan dust in our community in many distinctive ways. Our product provides the user with a current Saharan dust forecast which enables them to make informed decisions with their daily activities. This minimizes the chance of possible deterrents to instigate asthma attacks. In addition, our product educates the public about the effects of the Saharan dust in our community. Currently, this product has effectively informed many asthmatics about the effect of this dust, as related to the feedback from our survey within our website.

We hope to improve our website in many ways. For example, we will try to collect more accurate data on the tracking of Saharan dust. We also hope to continue to include the Caribbean Islands and eventually all locations where Saharan dust poses a threat globally. Furthermore, we hope to make our website more attractive and user-friendly by including more captions such as daily news about the other environmental issues that are affecting asthmatics around the Caribbean. In addition, we plan to continue our contact with Commander Capistrano at the US Air Station Borinquen to help provide a warning system that may be used by the aviation crew with the Coast Guard. Furthermore, we would like to Contact NOAA (National Oceanic and Atmospheric Administration) in relation to the effect of Saharan dust on coral reefs in the Caribbean to inquire if our system may be adapted to meet their needs.

It would be a success to have the daily reports of suggested activities automatically updated each three hours. Currently, this is done manually on a daily basis which is time-consuming and may not be as consistent. Finally, our group would like to continue investigations connected with NOAA and the world of medicine to verify the correlation between Saharan dust and Asthma. We hope that our website would be used by the Armed Forces, professional doctors, teachers, and all community members to help a larger population and become well informed about the effects of Saharan dust. Finally, we hope that the population who is informed with the data on our website would learn how to manage their activities appropriately due to possible reactions to this dust.
Website Link: www.saharadustwarning.com

Uploaded Files:

- [View] **Sahara Dust Impact** (By: broe9357, 02/24/2016, .jpg)
  This image shows the great impact of the Sahara Dust, This specific image was took in Londin, showing the great flooding through the area.
- [View] **Dust Impact Image** (By: broe9357, 02/25/2016, .jpg)
  This image shows the great impact of Sahara Dust in London. Image source: www.telegraph.com
- [View] **News article** (By: broe9357, 02/25/2016, .html)
  This news article was created by NASA's http://earthobservatory.nasa.gov/Features/Dust/. This helped us realize the impact of Saharan Dust.
- [View] **Saharn Dust Warning System Website Link** (By: Advisor, 02/29/2016, .docx)
  This is a link to the Saharan Dust Warning System website that serves are the experiment and final product.
- [View] **Website Flyer** (By: broe9357, 02/29/2016, .pub)
  This flyer describes the benefits of our website and was created by Bria and Janat.

Mission Verification

(1) Does your Mission Folder project involve vertebrate testing, defined as animals with backbones and spinal columns (which include humans)? If yes, team must complete and attach an IRB approval form.

No

(2) Did your team use a survey for any part of your project? If yes, team must complete and attach a survey approval form.

Yes

(3) You will need to include an abstract of 250 words or less. As part of the abstract you will need to describe your project and explain how you used STEM (Science, Technology, Engineering and Mathematics) to improve your community

In our project, we incorporated the engineering and design process which contains all the elements of STEM (Science, Technology, Engineering and Mathematics) to help find a solution to a critical problem in our community. The problem we investigated relates to the effects of the Saharan dust levels and questioning how we can create an effective warning system for people who suffer from asthma around Puerto Rico. We first used science by studying the variables and effects of the Saharan dust in our community as well as our experiments with the Saharan Dust Warning System. Technology was also used in building our prototype. For example, we integrated satellite images of the Saharan Air layer provided by NOAA. In addition, the online survey provided us with feedback that helped construct our website. We used engineering to create and develop a website that helped make a strong product that supported our research. Finally, we used mathematics by converting all of the data into percentages and graphs. Reading data collected also was a type of mathematics. In the end, it was important to reflect that this project is a continuous process of refinement. In our future design, we would use an app for smartphones to inform and alert the public about current forecasts. This design will help and benefit our community by providing asthmatics or people with respiratory problems with a device that will effectively warn them about the current Saharan dust levels and recommended activities for that day.

Uploaded Files:

- [**View**] **Survey Approval Form** (By: Advisor, 02/29/2016, .pdf)

  Signed and approved Survey Approval Form for Las Chicas de Puerto Rcio.

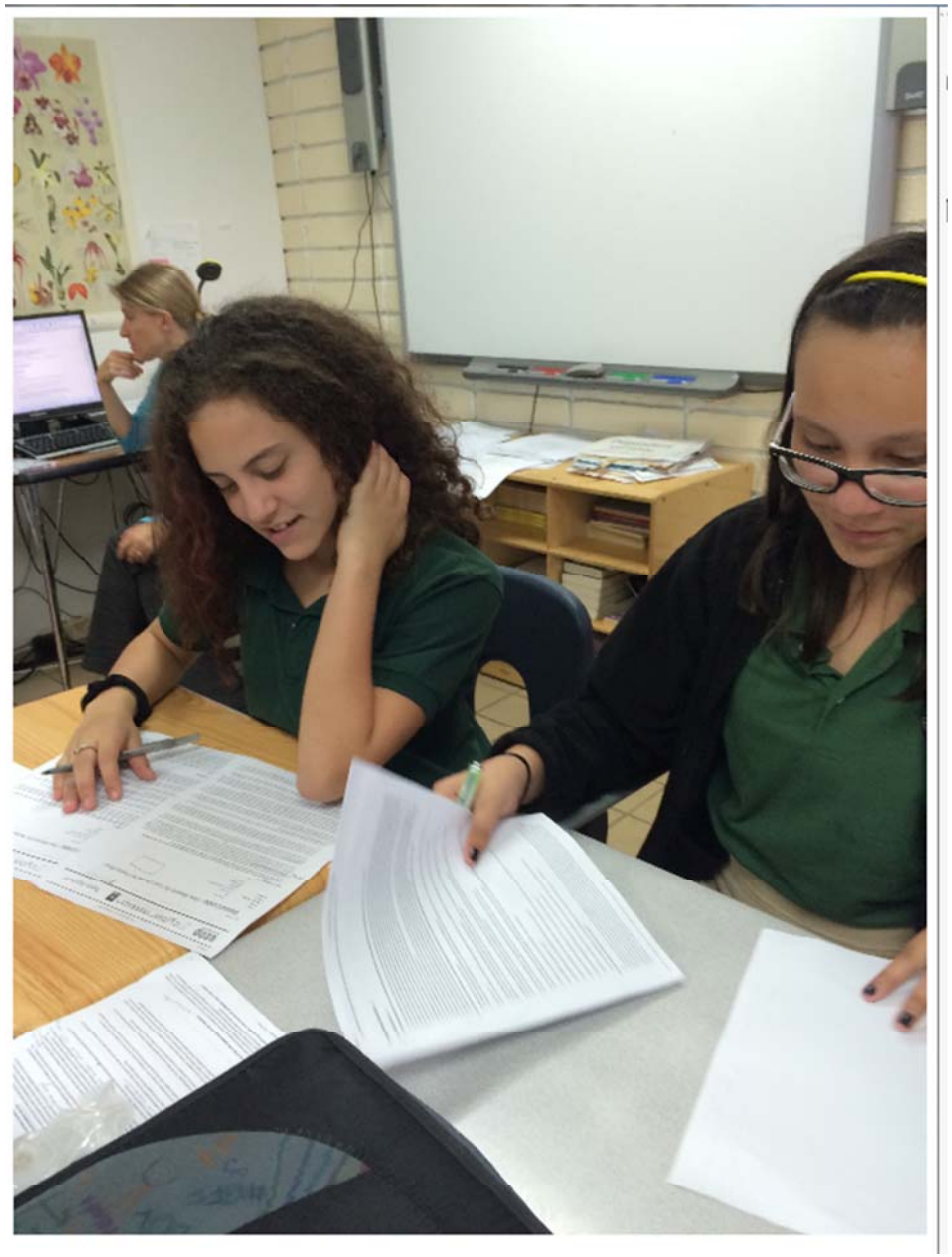
Tasks to be Completed

Team Collaboration	Due Date	Notes	Complete
Attachment • Calendar • Duties	2/15/16	The files need to be uploaded to Ecybermission Folder	Done
Problem Statement	2/23/16	Needs to be edited!	Done
Attachment (Bibliography)	2/23/16	Research how to do MLA format!	Done
Survey Request Form • Completed • Signed • Scanned	2/02/16	We still need it to be scanned and uploaded to Ecybermission.	Done
Survey • Created • Sent out • Attached	2/10/16	We completed the survey, but still need to upload it	Done
IRB Form • Completed • Signed • Scanned	2/23/16	We need it to be singed.	Done
Experimental Design	2/20/16	We need to finish last edits	Done
Build Prototype	2/21/16	We completed the website. Discuss unblocking it.	Done
Test Prototype	2/26/16	Make sure to colled all survey responses	Done
Community Benefits	2/26/16	Finish last edits	Done
Attachments • Brochures • Flyers • Posters	2/26/16	Try to make a flyer describing our website and its benefits	Done
Mission Verification	2/25/16	Do last edits	Done
Abstract	2/25/16	Have Janat edit all spelling	Done
Proofread. Is this your best work based on rubrics?	2/28/16		Done

Submit work?	2/29/16	Try to submit the work before the 29th	Done

Job Titles and Descriptions
Las Chicas de Puerto Rico
2016

Group Role	Task(s) in Group	Name
Leader/Manager/Organizer	Manages the group and ensures that members fulfill their roles in a timely manner.	Luz Bria Janat Janeliz
Recorder	Records group's answers and discussion outcomes.	Janeliz Janat
Materials/ Technician	Collects materials for the group and helps with technology	Luz Janat Bria
Questioner	Ensures that all possibilities have been explored by posing questions such as, "What is another idea?" or "How can we look at this problem in another way?"	Luz
Reflector	Observes the group's dynamics and for better group functioning. Also reflects on work to ensure that it aligns with the original question.	Janeliz Janat
Time Keeper	Keeps the group on task with the time limits of the activity.	Bria
Encourager/Coach	Encourages all members to participate and do their jobs.	Bria
Reporter/Spokesperson	Reports the group's findings to the class and other audiences.	Bria Luz Janat
Checker	Reviews work created by the group. Makes sure that each member can explicitly explain how the conclusion and solutions were derived.	Janat



MLA Format for our Resources.

Source: http://www.easybib.com/

1)ctepley@naic.edu (air quality specialist)

2)http://www.theguardian.com/world/2009/sep/27/dust-storms-diseases-sydney

The Guardian Dust storms spread deadly diseases worldwide Guardian News and Media September 26, 2009 February 25, 2016 John Vida

3)School nurse at Ramey School (DODEA) located in Aguadilla, PR

4)http://wwwhttp://tropic.ssec.wisc.edu/real-time/salmain.php?prod=splitEW

telegraph.co.uk/news/earth/environment/10739019/Sahara-dust-storm-prompts-serious-health-warning-for-asthmatics.html

5)http://response.restoration.noaa.gov/about/media/what-does-sahara-desert-have-do-hurricanes.html

What Does the Sahara Desert Have to Do with Hurricanes? | re February 25, 2016

6)http://www.weather.com/science/weather-explainers/news/saharan-dust-africa-caribbean-gulf-of-mexico

The Weather Channel Saharan Dust Travels More Than 5,000 Miles to South Texas February 25, 2016

7) http://www.conservationinstitute.org/interesting-sahara-desert-facts/

Conservation Institute 9 Interesting Sahara Desert Facts - Conservation Institute February 25, 2016

8) http://coastal.er.usgs.gov/african_dust/

The Effects of African Dust on Coral Reefs and Human Health February 25, 2016

http://earthobservatory.nasa.gov/NaturalHazards/view.php?id=83966

Saharan Dust on the Move : Natural Hazards February 25, 201

9) http://www.telegraph.co.uk/news/earth/environment/10740827/Saharan-dust-and-pollution-confusion-over-health-risk-from-smog-cloud.html

The Telegraph Saharan dust and pollution: confusion over health risk from Telegraph Media Group February 25, 2016

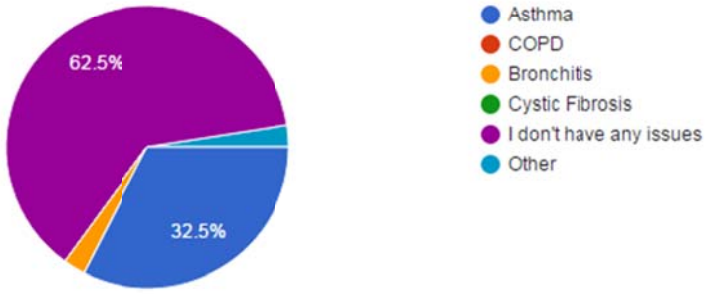
12) Commander Flip Capistrano,air station

11) http://thesaharadesertisonfire.blogspot.com/2012/11/current-human-impacts.html

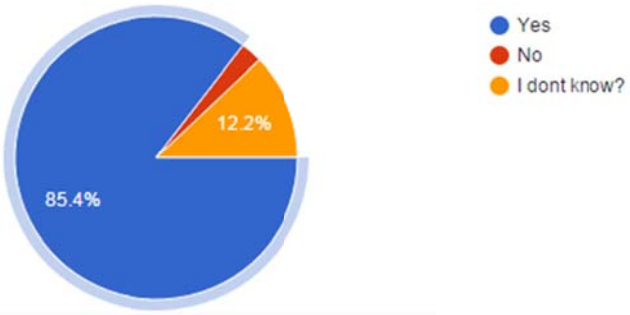
Current Human Impacts SAHARA DESERT February 25, 2016

13) Air Station Employees.: Commander Flip Capistrano, Chaplin Rice

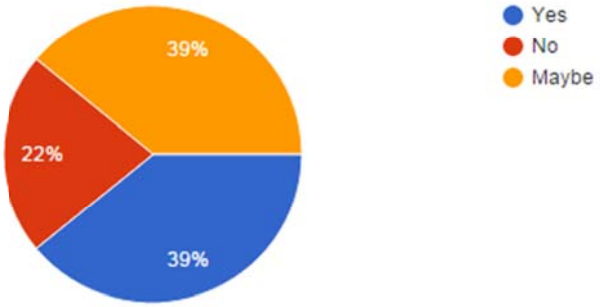
Do you have asthma or other respiratory issues? (40 responses)



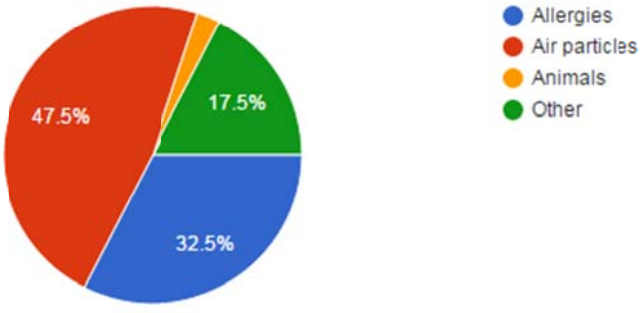
Did you know that Saharan Dust might be causing asthma attacks? Do you think a warning system would be helpful to asthmatics?
(41 responses)



Would you use this website (warning system)? (41 responses)



What are some other things you think are causing asthma? (40 responses)



Saharan Dust Survey

Before answering these thousands of miles to questions, you should know that the Saharan Dust is traveling thousands to reach Puerto Rico.

1) Do you have asthma or any other respiratory issues?
   (Circle one)
   -Asthma
   -COPD
   -Bronchitis
   -Cystic Fibrosis
   -I don't have any issues
   Other _____
2) Did you know that Sahara Dust might be causing asthma attacks? Do you think a warning system you be useful to them?
   (Circle one)
   -Yes
   -No
   -Maybe

3) Would you use this website (warning system?)

   -Yes

   -No

   -Maybe

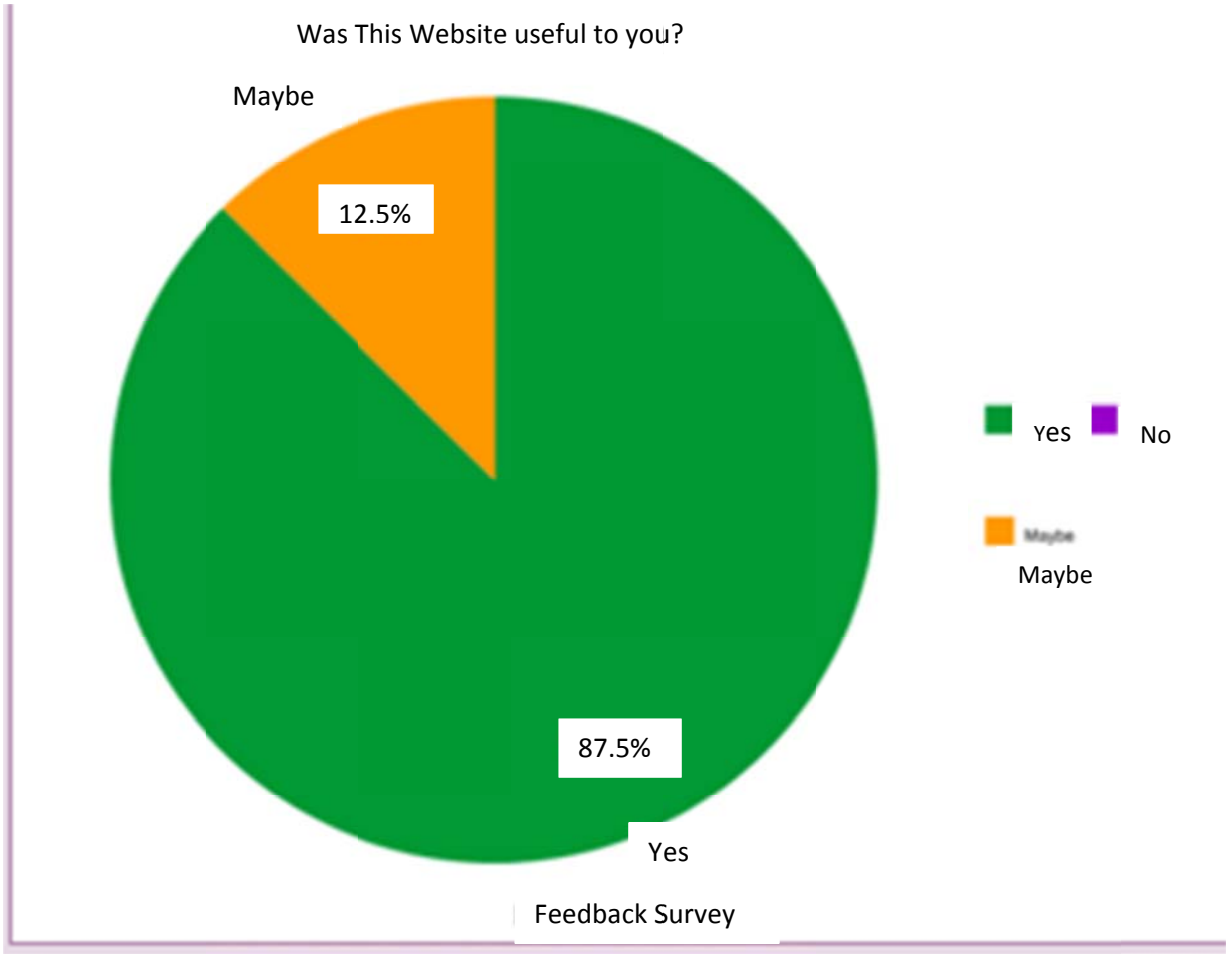
4) What are some other things you think are causing asthma?

   -Allergies

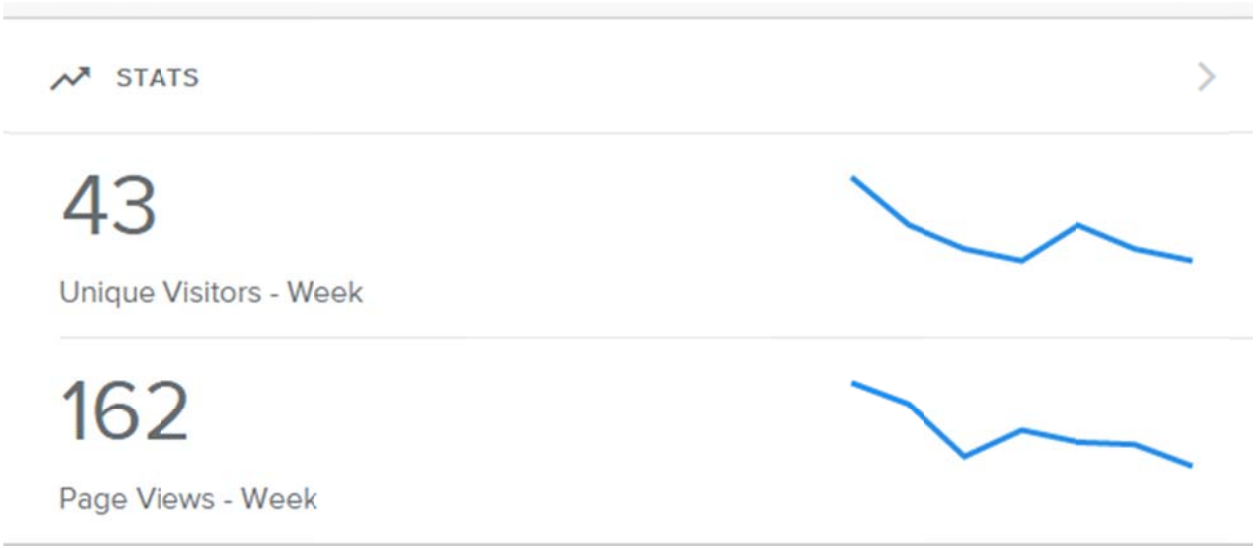
   -Air Particles

   -Animals

   -Other _____


Was This Website useful to you?
Maybe
12.5%
87.5%
Yes
Yes
No
Maybe
Maybe
Feedback Survey

Website Views

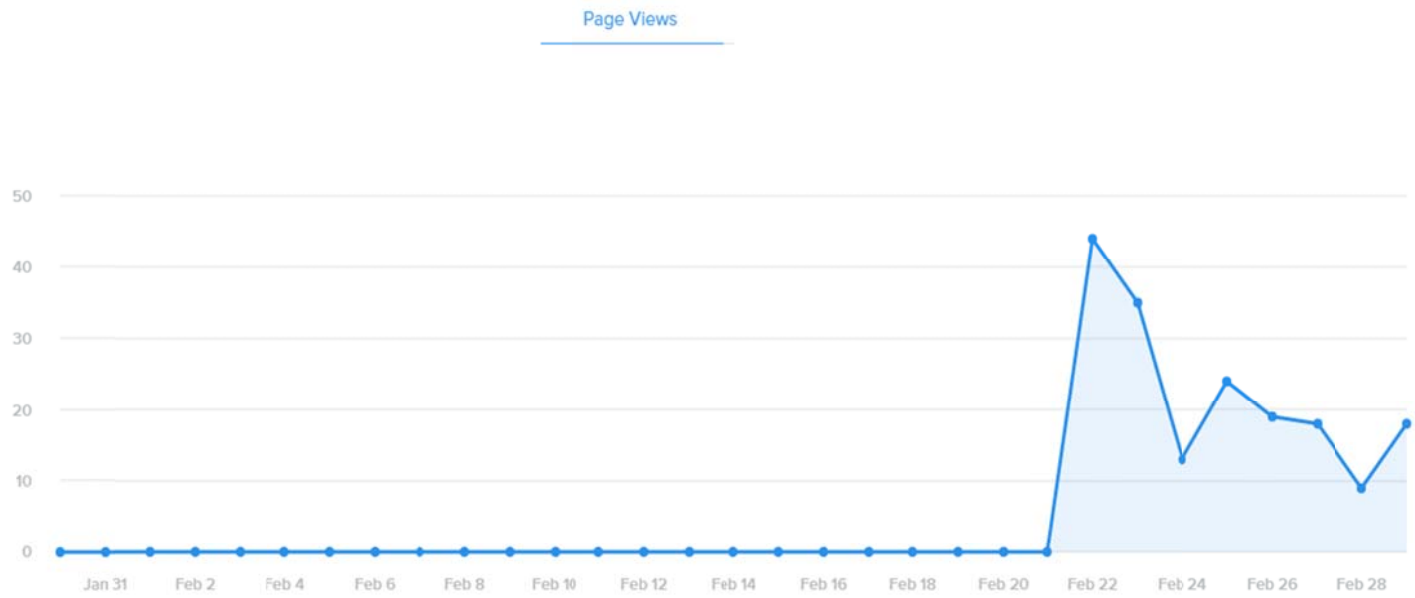


Unique Visitors: These are the visitor that went to our website more than once. This helped us realize that people used our website as a resource for their respiratory issues.

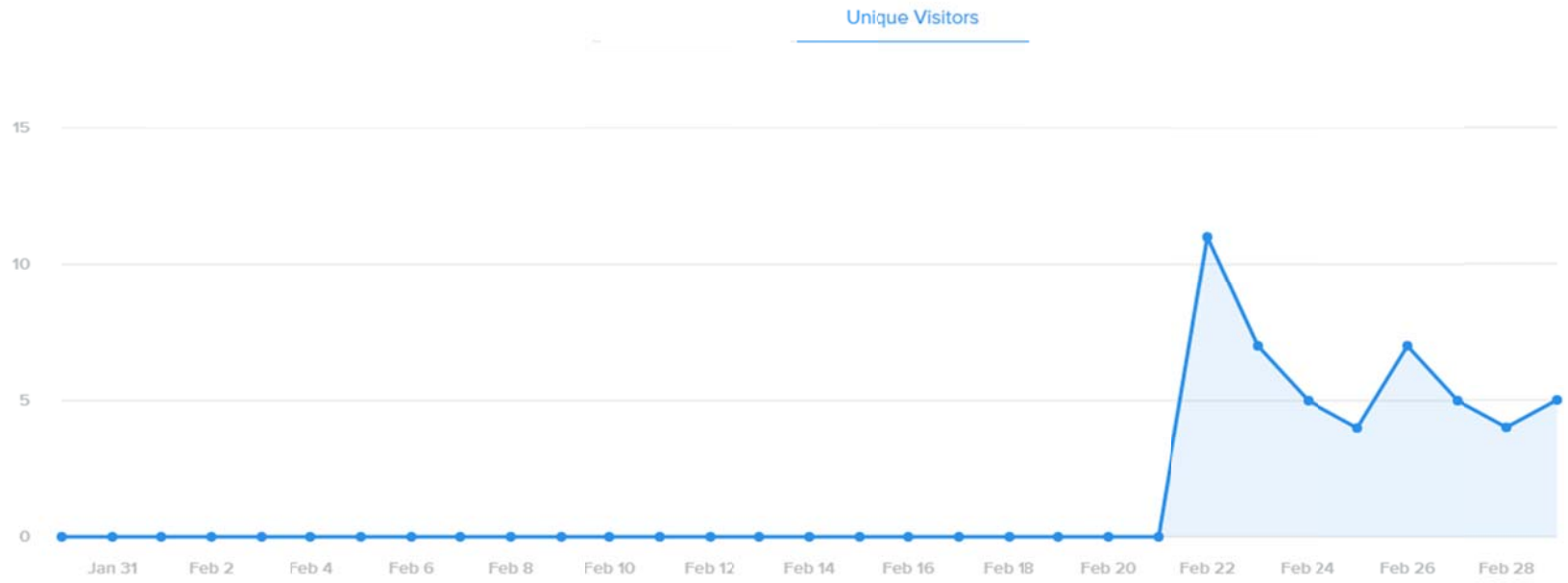
Page Views: This is the amount of visits for our website. (2/29/2016)

Graphs Made from Data

Statistics: Page Views Graph



Stats: This is the progression graph of the Unique Visitors.



Reference: Weebly.com created the progression graph of the stats of our page views and unique visitors.

When the Dust Settles by Laurie J. Schmidt

May 18, 2001

Each year, several hundred million tons of African dust are transported westward over the Atlantic to the Caribbean, Central America, and South America. Summer storms and accompanying warm air can lift dust as high as 15,000 feet above the African deserts, and then out across the Atlantic.

African dust storm

Now, thanks to satellite imagery, scientists can observe the path of transport. The ability to see dust storms from space, coupled with soil analyses, are leading some researchers to theorize a relationship between degradation of Caribbean marine species and airborne pathogens. The researchers also believe the dust may be contributing to human health problems.

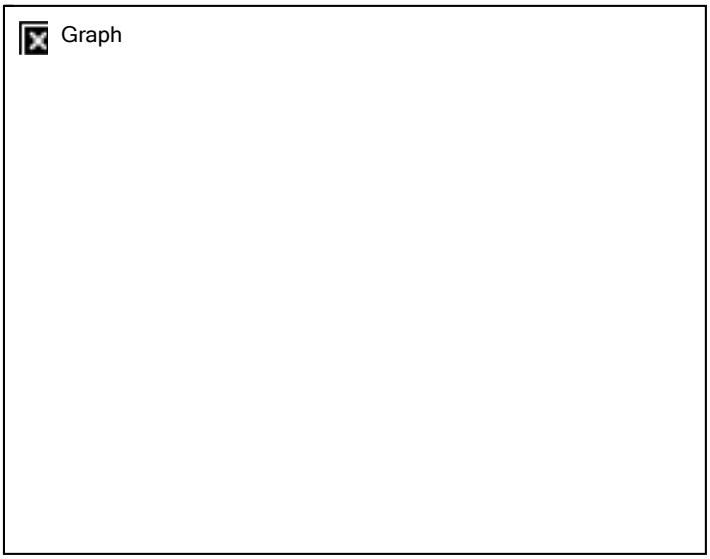
Dust storm sweeps from Africa into the Atlantic. Click here for more information (will open in a new window).

Since the 1970s, coral reefs in the Caribbean have been in a state of continual decline, and several other marine species suffered mass mortalities in 1983. Coincidentally (from 1970 to the present), transatlantic dust transport from North Africa increased dramatically, with peak dust years occurring in 1973, 1983, and 1987, according to a group of scientists.

"Our hypothesis is that much of the coral reef decline in the Caribbean is a result of pathogens transported in dust from North Africa," said Gene Shinn, senior geologist at the U.S. Geological Survey (USGS) Center for Coastal Geology in St. Petersburg, Florida. Shinn, who has spent most of his career studying marine sediments and ground water movement, has witnessed dramatic changes in coral reefs during the

last four decades. "I started taking pictures of individual reef areas back in 1959, and the photo record shows that the reefs have been steadily declining," he said.

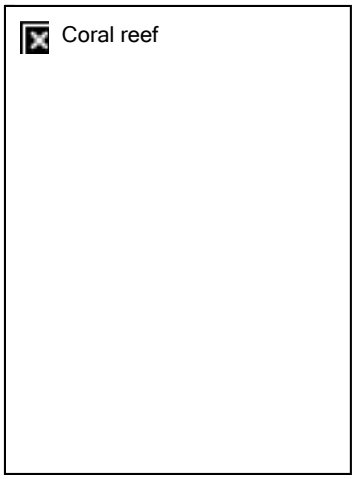
Then Shinn came across a graph of African dust flux developed by Joe Prospero, an atmospheric chemist at the University of Miami, who had been measuring dust on the island of Barbados since 1965. The graph showed dramatic increases in dust flux beginning with the onset of the drought in North Africa that started around 1970, with peak years occurring in 1973, 1983, and 1987. "I knew these were significant years, especially 1983 and 1987, for certain species mortalities that occurred in the Caribbean," said Shinn.



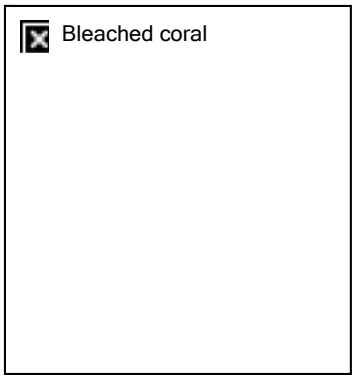
Barbados Mineral Dust Annual Average and Benchmark Caribbean Events

Dust deposition peaked in 1983 and 1987, years when extensive environmental change was evident in Caribbean coral reefs. (Image adapted from the USGS Center for Coastal Geology: Coral Mortality and African Dust, courtesy of Dr. Joe Prospero, University of Miami. A new browser window will open.)

Extending throughout coastal zones of warm tropical and subtropical waters, coral reefs are among the world's most diverse and productive ecosystems. The large, wave-resistant structures are formed by colonies of billions of tiny coral animals, called polyps, which secrete hard calcium carbonate skeletons for protection. Accumulations of these hard skeletal structures build up coral reefs over time. Coral reef growth rates vary, depending on the species of coral



Reef inhabitants produce a profusion of color in the Caribbean. (Image courtesy of Sustainable Seas Expeditions. A new browser window will open.)



When a brain coral expels the symbiotic algal cells that give it color, it is bleached like this coral. Coral bleaching is associated with warm water conditions, especially during the years of maximum dust transport. However, dust alone has not been proven to cause coral bleaching. (Image courtesy of the USGS Center for Coastal Geology: Coral Mortality and African Dust. A new browser window will open.)

and environmental conditions, ranging from 0.3 to 10 centimeters per year.

Reef-dwelling corals have a mutually beneficial, or symbiotic, relationship with plant-like algae called *zooxanthellae.* These algae produce food, via photosynthesis, and also provide the coral polyps with their brilliant color. In a process known as "coral bleaching," corals under environmental stress expel these algae from their tissue, exposing the colony's white calcium carbonate skeleton. Episodes of coral bleaching proliferated in Florida and the Caribbean in the late 1980s and 1990s, with a major event occurring in the summer of 1987, Shinn's team reported in the October 1, 2000 issue of *Geophysical Research Letters.*

A species of soft coral, called sea fans, suffered a widespread die-off in 1983, and again in the mid-1990s. Environmental scientists have long suspected that a pathogen was released into the environment and spread to the Caribbean region. But the pathogen was never identified.

In 1983, a species of long-spined sea urchin, called *Diadema antillarum,* experienced severe mortality that decimated the entire population within one year. *Diadema* are herbivores that crawl on reefs eating the algae, a process which keeps the reef clean. "When a new coral larva lands on a clean rock surface it has a good chance of propagating, but if the rock surface is covered with algae, it's very difficult for new coral growth to begin," Shinn said.

The unknown pathogen first struck *Diadema* populations in Panama in mid-January, 1983, the team reported, and by the following July had spread to reefs in Belize, Mexico, and the Florida Keys. This path suggested rapid movement of the suspect pathogen in the main Caribbean current, a deduction that supports the team's dust transport hypothesis.

Sea fan

African dust contains spores of a fungus that can be destructive to sea fans. This sea fan has suffered damage from a fungal infection. (Image courtesy of the USGS South Florida Restoration Science Forum. A new browser window will open.)

Bromeliad

The bromeliad plant family includes many epiphytic species that grow on

Diadema

Photographed before 1983, *Diadema* sea urchins keep a dead coral surface free of algae. In the summer of 1983, most *Diadema* urchins died, leaving the coral covered with algal mats that impeded establishment of coral larvae. (Image courtesy of the USGS Center for Coastal Geology: Coral Mortality and African Dust. A new browser window will open.)

Scientists have long known that dust clouds travel long distances. Iron- and clay-rich soils found on many Caribbean islands originated as dust from Africa, and studies show that essential nutrients in Hawaiian rainforests are transported via dust from Asia. African dust also supports a robust bromeliad-based ecosystem high in the tree canopy of the Amazon rainforest, according to Shinn. "The ecosystem in the tree canopy is based on red soil and includes various bugs and worms," he said.

A long-term drought in the Sahel region of North Africa that began in the early 1970s, along with overgrazing and the drying of Lake Chad, are believed to contribute to the increase in dust that is carried across the Atlantic Ocean (see From the Dust Bowl to the Sahel). "We know that the variations in dust concentration measured in the Caribbean and Western Atlantic correlate with rainfall deficits in North Africa, especially in the Sahel region," said Prospero. "If the dust is altering the health of ecosystems, then this could be a significant climate-related effect."

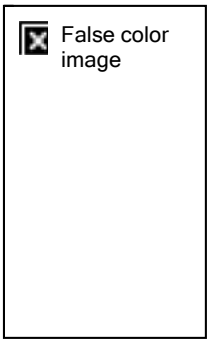
On February 26, 2000, NASA's Sea-viewing Wide Field-of-view Sensor (SeaWiFS) captured a massive dust storm as it blew off the coast of North Africa and reached 1,000 miles into the Atlantic. The SeaWiFS instrument, part of NASA's Earth Science Enterprise (ESE) project, collects global data on earth's oceans and land every two days and is the first mission

other plants and derive moisture and nutrients from the air. African dust supplies soil for epiphytic plants living in the tree canopy. (Image courtesy of the U.S. Information Agency, photo by M. Bleeker.)

SeaWiFS and TOMS data products are distributed through the Goddard Space Flight Center DAAC (now named the GSFC Earth Sciences DAAC). Landsat data products are available through the EROS Data Center DAAC (now named the Land Processes DAAC). (A new browser window will open for each.)

capable of monitoring the global biosphere. Since the orbiting sensor can view all cloud-free ocean regions every 48 hours, SeaWiFS data have proven useful in atmospheric science research.

Data from the Total Ozone Mapping Spectrometer (TOMS), available from NASA's Goddard Space Flight Center, provides the scientists with "real-time" images of dust storms. The TOMS is the first instrument to allow observation of aerosols as the particles cross the land/sea boundary. "I can look at TOMS data on NASA's Web site and see a dust storm coming; then my colleague in the Virgin Islands confirms that visibility is only about two miles that day," said Shinn.



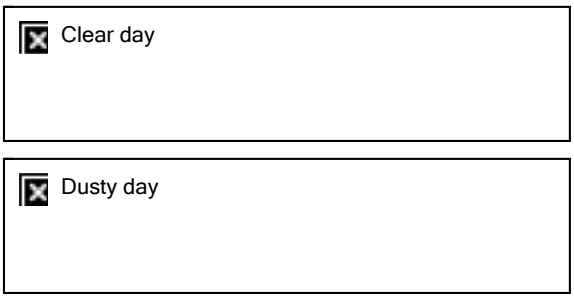
In this Landsat image, red indicates vegetation growing on a small island off the coast of Mexico (known as Chincorro Bank). The blue-green regions around the island represent shallow coral reef areas. (Image courtesy Serge Andrefouet, University of South Florida, and the Landsat 7 Team)

In addition, remote sensing data from NASA's Landsat 7 satellite enable coral researchers to map and monitor the health of coral reefs around the world (see Mapping the Decline of Coral Reefs). By looking at the variability of the pixels' brightness on a set of Landsat images, scientists can map the extent of change a reef has undergone and, by observing color fluctuations, can even identify when a reef changes from living (polyp-covered) to non-living (algae-covered).

"Some early studies surmised the transport flow, but the advent of remote sensing is what really made it possible to see the dust's precise course," said Shinn. Satellite imagery shows that African dust is transported mainly toward the Caribbean and equatorial regions of South America during North American winters, and then shifts north towards Florida and the Southeast United States during summers, the team reported in their paper.

"You have to live in the Virgin Islands to fully comprehend the amount of red dust people clean from boat sails, decks, and window screens there," said Shinn.

Ginger Garrison, a USGS marine ecologist who lives on a boat in the U.S. Virgin Islands, understands the situation better than most. "During an African dust event, our normally clear blue skies turn a hazy gray, and visibility degrades from unlimited to only a few kilometers," she said.



Two photographs looking north from St. John, toward Jost Van Dyke, show the difference airborne dust makes in the British Virgin Islands. (Images courtesy of USGS, photos by Ginger Garrison.)

Using a vacuum pump, Garrison set up a filtering device that captures dust samples, which she then places in sterile containers and sends to microbiologists working with the team. Dale Griffin, a post-doctoral microbiologist hired with funding from NASA, cultures and identifies microbes in the dust samples. So far, Griffin and team member Christina Kellogg have cultivated over 130 bacteria and fungi isolates, most of which came from samples collected during Caribbean dust events that occurred in 2000.

"We typically isolate about two colonies of fungi from clear air samples, whereas we might recover 20 to 40 isolates of fungi and bacteria from samples taken during dust events," said Griffin. Griffin's studies also show the presence of viruses in the dust, although further species identification needs to be done.

According to Shinn, the team's finding that viable microorganisms are making the journey in the dust was surprising. "Most microbiologists will tell you that ultraviolet light kills bacteria during an exposure time of five to six days," said Shinn.

But Griffin said that overlying dust clouds, as well as smoke from slash-and-burn agriculture, might act as a filter, depleting ultraviolet (UV) sunlight. "Microbes at lower altitudes in the dust clouds receive lower doses of UV, which could enable them to survive," he

said. Another possibility, according to Griffin, is that the microbes may adhere to cracks or crevasses on dust particles, which could protect them via shading.

A correlation between increased dust and outbreaks of the disease that struck the Caribbean sea fans also appears to exist. Garriet Smith, a researcher at the University of South Carolina, identified *Aspergillus*, a soil fungus, as the cause of sea fan disease. But since *Aspergillus* does not reproduce in seawater, a constant supply of spores was needed to explain the ongoing nature of the disease. Later, Smith and colleagues isolated *Aspergillus sydowii* from the dust samples and inoculated healthy sea fans with the culture, achieving a 50 percent positive reaction. "So far, that is the best smoking gun we have for proof that microbes transported in the dust are having a detrimental ecological effect," said Shinn.

"Occasionally, swarms of large grasshoppers get caught up in the dust and make it all the way from Africa to the Caribbean — alive," said Shinn. Pesticides, many of which have been banned in the U.S., have also been detected in African dust that accumulates in drinking water cisterns in the Caribbean, according to Shinn.

Heavy metals, including mercury and arsenic, and elevated levels of lead-210 and a naturally-occurring radioactive isotope known as beryllium-7, have also been detected, Shinn said. But according to USGS geologist Chuck Holmes, these levels can't be characterized as dangerous until further studies are done.

In addition to affecting marine ecosystem health, the researchers suspect that the dust may trigger respiratory health problems in humans. According to Shinn, levels of asthma on the islands of Barbados and Trinidad are among the highest in the world. "The incidence of asthma on Barbados and nearby Trinidad, as documented by the Caribbean Allergy and Respiratory Association (CARA), has increased 17-fold since 1973," he said. "And that was the first year that Prospero's graph showed a big spike in the dust record there."

The *St. Petersburg Times* reported that the number of Americans with asthma has increased 154 percent since 1980. Hillsborough County, Florida, which

includes the Tampa Bay region, has one of the state's highest asthma rates, with 7.1 percent of students now reporting asthma symptoms, compared to 2.7 percent just four years ago.

"According to Prospero's work, about half the particles breathed in South Florida during summer months originate in Africa," said Shinn. "The asthma epidemic in areas that are relatively free of industry correlates with the increased flux of African dust that has been continuously monitored in Barbados since 1965."

Prospero is proposing a study to examine increased outbreaks of asthma in the Caribbean. "We will use remote sensing to look at the relationship between the number of people presenting asthma symptoms at hospital emergency rooms and the occurrence of African dust," he said. If approved, Prospero's study will include culturing dust samples for the presence of fungi, pollen, and other microorganisms.

But researchers need to exercise caution in interpreting results, according to Prospero. "Not a lot is known about wind-transported disease," he said. "At this point, it's a hypothesis that has some supporting evidence. But it's a complicated subject."

Shinn said his immediate goal is to continue identifying microbes in the dust. "Proving or disproving a causal relationship between African dust and coral reef demise has the potential to redirect research efforts more wisely," he said.

The decline of coral reef health is generally attributed to pollution, sedimentation, or warm water associated with the North Atlantic and El Niño Southern Oscillations. In a 1999 article published in *Science*, Harvell and colleagues reported that a dramatic global increase in the severity of coral bleaching in 1997-98 was coincident with high El Niño temperatures.

While Shinn acknowledges that changes in water temperatures have contributed to or caused coral bleaching, he claims that some damaged coral reefs are located in isolated areas where pollution or runoff do not occur. "Elevated water temperatures from El Niño caused widespread coral bleaching, but pollution and sedimentation do not explain why coral reef disease occurs in regions that are remote and unpopulated," he said.

In addition to analyzing microbes in the dust, Shinn plans to collect 20-foot sediment cores from an offshore sink hole near Belize — samples that he hopes will provide several thousand years of dust transport history.

"Our findings so far demonstrate the need for further studies," said Shinn. "If soil dusts serve as carriers for microbes, pesticides, heavy metals, and insects, then monitoring and prediction of these transatlantic dust events is warranted."

Allison, W., 2000. Breathing Lessons: Learning to Live with Asthma. *St. Petersburg Times.* February 11, 2000.

Harvell, C.D., K. Kim, J.M. Burkholder, R.R. Colwell, P.R. Epstein, D.J. Grimes, E.E. Hofman, E.K. Lipp, A.D.M.E. Osterhaus, R.M. Overstreet, J.W. Porter, G.W. Smith, and G.R. Vasta. 1999. Emerging Marine Diseases — Climate Links and Anthropogenic Factors. *Science.* 285(5433), pp. 1505-1510.

Shinn, E.A., G.W. Smith, J.M. Prospero, P. Betzer, M.L. Hayes, V. Garrison, and R.T. Barber. 2000. African Dust and the Demise of Caribbean Coral Reefs. *Geophysical Research Letters.* 27(19), pp. 3029-3032.

African Dust Causes Widespread Environmental Distress. USGS Information Sheet. April 2000. http://coastal.er.usgs.gov/african_dust/ Accessed April 19, 2001.

The Earth Observatory is part of the EOS Project Science Office located at NASA Goddard Space Flight Center
webmaster: Paul Przyborski | NASA official: Charles Ichoku

Sahara Dust Warning System Website Link

This link will direct people to the website used to inform people about current Saharan dust levels. It also educates them about Sahara dust and how it effects Puerto Rico.

http://www.saharadustwarning.com/


SAHARA DUST WARNING WEBSITE
This website will effectively warn you about the latest Saharan dust impact!
We hope it will decrease the amount of asthma attacks around Puerto Rico!
Very easy to use!
It is free to use!
WWW. Saharadustwarning.com

eCYBERMISSION Survey Approval Form

eCYBERMISSION team name: Las Chicas De Puerto Rico

Team Advisor name: Ingrid Rapatz-Roettger

Team Advisor email: ingrid.rapatz@am.dodea.ed

Team Advisor phone: 1-787-407-5281

Student usernames: broe9357, jkha9348, FHL129384756, LuzFigueroa

School name: Ramey Unit School

School address: 201 Arch Road, Aguadilla, Puerto Rico, 00603

Describe the survey your team will conduct:

This survey will include various questions about the effectiveness of our website. We will first ask the paricipants whether or not they have asthma or other respiratory issues. This method will help the students understand more about the Saharan Dust issues, and how it may affect their everyday lives. Some facts include general information about the Sahara Dust as well as the funguses that it carries. The other questions ask whether or not they think our website would be effective for our daily lives and if they would a use it. The students' feedback would help us conclude whether or not our final product would be useful. We will also conduct a English and Spanish version of this survey to accomodate all students.

Describe the participants you plan to distribute your survey to:

In order to get an accurate hypothesis, answer, or statement, we will need a large amount of responders to answer and fill out our survey. We decided to use the middle and high school students at Ramey Unit School. We decided not to suvey the elementary students (Pre-k through 5) because research says that the most accurate data comes from those with the most experience. Knowing that it comes to topics like, this we decided to use this population. The amount of students would be approximately 250 students. We are hoping to get at least 150 surveys back so we could get the most accurate research and data.

Project approved by school administration?

☑ Yes ☐ No

Approved by: Thelberstine Barber

Title: Asst. Principal

Date approved: Feb 5, 2015

Signature, School Administrator: Thelberstine Barber

*Please save form and upload to your team's Mission Folder.