



If you answered yes or maybe please briefly describe what you believe/know are the hazards:

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4. Please check below where you reside:

North Kohala\_\_\_\_\_ North Hawaii\_\_\_\_\_ Big Island\_\_\_\_\_ In the state of Hawaii \_\_\_\_\_  
Mainland\_\_\_\_\_ Foreign\_\_\_\_\_

5. Answer **only if you live in or near North Kohala**:

Would you "recycle" household batteries if there was a drop off location in North Kohala?

**Yes**\_\_\_\_\_ **No**\_\_\_\_\_ **Maybe**\_\_\_\_\_

AGE Please check: young adult (18-29)\_\_\_\_\_ adult (30-54)\_\_\_\_\_ senior (55 plus)\_\_\_\_\_

## Step 2: Research It!

### TASK

Describe the inquiry-based research your team did to identify the focus of your project. Include below a clearly defined problem statement that defines the issue and shows evidence of how it is a problem in your community. The problem statement should be developed using both personal observations and collected data. Be sure to include citations for researched data.

Limit your response to 800 words.

### TEAM RESPONSE:

Our community is isolated and rural with limited access to recycle options. There is no opportunity to recycle household batteries at our recycle center. We believe most residents don't know how to properly dispose of batteries and won't drive the distance to do so. There's lack of information provided to community members on potential hazards of batteries.

#### 1. Recycling

We researched battery-recycling opportunities. Hazardous Waste Collection happens once/year at a center 20 miles from our community, 2/x 60 miles and 3/x 80 miles away. According to Linda Peters, County Department of Environmental Management, Hazardous Waste collection is a great expense to the county and she doubts they could add more days and locations. Her thought was that stores who sell batteries should take them back to recycle. We called 7 franchise stores (50-80 miles away) and found only 1 collected them; they only took rechargeable batteries.

There are companies on the mainland who provide collection boxes at stores.

1. Battery Solutions Inc. doesn't collect in Hawaii. However, we could pack the batteries (all except lithium) in flat rate boxes, get an RA # (Return Authorization) and pay .85/lb. to ship Mesa, Arizona. They're hand sorted, trucked to Michigan to their recycle plant. (Transporting batteries is the biggest cost.)
2. E-mail from Call2Recycle informed us they cannot ship collection boxes out of the Continental US and they only take rechargeable batteries.

State resources were no better:

On Oahu Island Recycling also charges (<http://islandrecycling.leads.com/what-we-buy/batteries>). We would have to pay to ship them to Oahu.

We could find no business on our island recycling household batteries, only car batteries.

We called Enviroservices the company licensed by the county to dispose of batteries. They ship them to Seattle.

## 2. Hazards

The harmful effects of batteries were researched. We each researched articles and discussed them. We became familiar with the various types of batteries(1), including rechargeables. In general it appears rechargeables are less harmful to the environment.(2) However, they're more expensive and they still contain toxic chemicals and should be recycled.

"More than 15 billion batteries are tossed into landfills every year, releasing heavy metals and toxic substances into our land, air and water" (3)Mercury use to be the problem but the Mercury-Containing and Rechargeable Battery Management Act was passed in1996 with less mercury and more strict requirements for batteries.(3) However, we also found that Cadmium may also be a problem. Leachate (liquid waste in the landfill) can lead to cadmium entering the ground water. Cadmium can biochemically replace zinc in your body and cause problems.(4)

"Controversy exists about reclaiming household batteries. Currently, most batteries collected through household battery collection programs are disposed of in hazardous waste landfills. Even stores and chains that have established take-back programs admit that it often ends up in the trash."(1)

We assume because of the lack of recycling opportunities a lot of our batteries go into the local landfill. We researched about our local landfill; it's a Subtitle-D - lined with geomembrane and leachate collection system. We spoke to and e-mailed Donna Alms, Operations Specialist West Hawaii Landfill.

We researched the effectiveness of Subtitle-D landfills in keeping leachate from entering the ground water. We reviewed the Solid Waste Association of North AmericaSummary -Report "Recent Studies Indicate Minimal Heavy -Metal Releases from MSW Landfills" and found it much too technical. We also reviewed comments byG. Fred Lee, PhD, PE, and DEE who challenged the validity of the report. We decided that potential leaching from landfills into ground water is too controversial. We don't know who to believe so we're focusing on "better be safe than sorry". Our concern is that most of our drinking water comes from groundwater.

We researched what other states are doing. California requires all retailers that sell or have sold rechargeable batteries to take back spent batteries for recycling at no charge to the consumer. Also in the plans is AB 2271 to establish a 10-cent Consumer Refund Value (CRV) on all household batteries.(5)

## 3. Battery Use

In the U.S. about three billion batteries are sold annually, averaging ~ten per person. The average person owns about two button batteries, ten normal (A, AA, AAA, C, D, 9V, etc.) batteries, and throws out about eight household batteries per year. (1)

## 4. Other Research

We examined the Australian Rezap that will charge alkaline batteries. Our thought was that we could recharge and resell batteries. This would help "recycle" batteries and may be good money making project.

To help with our surveys we researched the possibility of an online survey. We experimented with Survey Monkey. We also researched our demographics and found that over 50% of our population is over 45. We will not do an online survey.

We also decided we should educate people about recycling batteries but also on extending battery life. We found tips that we'll use in our educational efforts. Paul from Battery Solutions said to roll the batteries while in place to get rid of oxidation.

## CITATION:

(1)"Battery Disposal Guide for Households - Where to Safely Recycle Used Batteries." *EHSO - Environmental Health & Safety Online – Free EHS Guidance Contents Page*. <<http://www.ehso.com/ehshome/batteries.php>>

(2) Writers, Staff. "Help the Environment by Using Rechargeable Batteries | Green Living Articles | Eco-wisdom.com." *Learn, Discuss and Act Green | Eco-friendly Advice for the Green Consumer | Eco-wisdom.com*. N.p.,n.d.Web. <<http://www.eco-wisdom.com/articles/electronics/use-rechargeable-batteries.html>>

(3)Dombrowski, Margie Monin. "Battery Recycling for Dummies - 1-800-Recycling." *1-800-Recycling - Find Recycling Center Locations*. Web. <<http://1800recycling.com/2009/09/battery-recycling-for-dummies/>>.

4)<http://www.livestrong.com/article/174175-the-effects-of-waste-disposal-on-groundwater/>"The Effects Of Waste Disposal On Groundwater | LIVESTRONG.COM." *LIVESTRONG.COM - Lose Weight & Get Fit with Diet, Nutrition & Fitness Tools*. Web. <<http://www.livestrong.com/article/174175-the-effects-of-waste-disposal-on-groundwater/>>.

(5)[http://www.cawrecycles.org/living\\_green/battery\\_disposal](http://www.cawrecycles.org/living_green/battery_disposal)

## Step 3: Plan It!

### TASK

Share your team's action plan, including project steps, timeline for completion, necessary resources, and how your team planned to measure whether your potential solution is working to impact or fix the problem. Tell how all members contributed, and share any necessary modifications to the plan that were made along the way.

Limit your response to 450 words.

### TEAM RESPONSE:

In October we were amongst 25 students selected to work on the project. This wasn't a class project; our work took place during recesses, after school and weekends. We felt if there are local opportunities to recycle batteries, provide information on battery hazards, efficient use of batteries and proper disposal, then less batteries will go into the landfill. If our project succeeds we intend to lobby the government/businesses for better household battery recycling efforts.

We decided the catchy title 6000 'n 60 may cause people to join our efforts. We intend to collect 6000 batteries (~population of North Kohala in 60 days (from MLK to March 19). Our mentor received a grant from YSA to help initiate the project.

General plans for the project included:

1. Logo- We had a name but wanted an appealing logo. (Rico's logo idea helps all, especially children, understand that recycling batteries helps the earth.)
  - a. Use logo in all "advertising"
  - b. Make logo t-shirts for all team members
2. Determine the best drop off locations and collection containers.
3. Determine project promotions:
  - a. We'll engage students/staff at KMS to help
  - b. Types of media releases: Posters, PSA's-radio/TV, newspaper articles, Facebook, etc.
  - c. Presentations to classes/community groups
  - d. Make a "progress thermometer", put in a visible/central location
  - e. Send flyers with elementary students
  - f. Door-to-door campaign
  - g. Plan a community kick-off event
4. Develop pre/post-surveys
5. Call "franchise" stores to ask if they collect household batteries
6. Develop a plan for recharging batteries; attend business plan class to determine feasibility
7. Plan fun events to keep 6000 n 60 participants involved
  - a. field trip for entire group during school
  - b. trip to the beach
  - c. write hotels/eco-tours for free passes for incentives
8. Visit/speak to the government officials with our project/results

10. Contact battery manufacturers with results to encourage their help with recycling batteries

Data required:

1. Pre-survey would determine if people:
  - a. Knew about recycling opportunities
  - b. Made efforts to recycle batteries
  - c. Knew about harmful effects of batteries
2. Random survey of people on their battery usage to determine if
  - a. 6000 would be a reasonable number
  - b. If we meet the norm of 10 batteries/person
3. Battery collection:
  - a. Determine who/how to pickup/sort/count batteries
  - b. Record brands of batteries for the first 1,000 (should we lobby companies we'll have an idea which companies are most popular in our area)
  - c. Test the batteries and save ones that tested in the good range for recharging
  - d. Determine what percentage of collected batteries are "good"
  - e. Determine the batteries/pound for each battery type in case counting becomes too difficult
  - f. Record our progress on our thermometer

#### **CITATION:**

## **Step 4: Do It!**

### **TASK**

Share how your team went about collecting data, keeping thorough and accurate records, testing their ideas and hypotheses and making systematic observations about whether or not their solution is working. Share descriptions of any written notes, data tables, sketches, photographs or video captured during the data collection step.

Limit your response to 650 words.

### **TEAM RESPONSE:**

6000 n 60 students began meeting in October to discuss project ideas, set goals and responsibilities. Four students were chosen to participate in the Siemens Challenge, with alternates. Along with Aunty Lani we are the primary leaders. We will be referred to as the SCG.

Many ideas were suggested for our **logo**. Rico's idea of a brown earth plus recycle sign equals green earth, math signs done with batteries was chosen. Our mascot is "Scotty the Earth Bunny", a take off on the Eveready battery bunny. We had t-shirts made for all 6000 n 60 participants.

Our **pre-survey** needed to be simple, quick and collect enough information. We didn't do online survey per research. We added a

question on computer ownership and online surveys for future use. Group members, were to survey at least 10 people each. SCG did surveys outside our local grocery store.

The group voted on suitable **locations** for bins that would be central, accessible, high-traffic areas. We chose 3 grocery stores, the hardware store and 1 gas station/convenience store.

Plastic **containers** with lids were chosen. Genevieve suggested cutting holes in the top and line with duck tape-pink to be visible. The Service Learning (SL) class made them. It looked sloppy; we went with other containers.

**Promotion** was varied and on going:

1. Kohala Middle School (KMS) students were aware through school bulletins, talks at assemblies, morning announcements, posters and being involved.
2. The 2<sup>nd</sup> quarter Media Production Class (included 2SCG) created a variety of PSA's. Time ran out and final edits were not done.
3. Articles featured in main papers.
4. Posters were distributed.
5. Leadership Class made progress thermometer (included 3 SCG).
6. SCG made presentations to: Merchants Association, Churches, Community Meal, Senior Citizens, After-school Elementary program and informal gatherings.
7. Flyers were sent home with every K-5<sup>th</sup> students (~400).
8. Community Kickoff January 18<sup>th</sup> included skits, sharing the project and Scotty the Earth Bunny for the children. Angela Kang, County Office of Environmental Management (OEM) spoke and commended students. A highlight was entertainment by KMS students and food!
9. We created a 6000 n 60 Facebook Fan Page.
10. Our thermometer and signs were placed at the busiest intersection in town.
11. SCG interviewed people on number of batteries/household to see if we fit the 10/batteries/person U.S. norm.

**Guest speakers and experts** helped us:

1. Michelle Medeiros from Earls Garage explained the Rezap charger.
2. Jerry Williams retired NRCS (Natural Resources Conservation Service) Conservation Planner spoke to SCG about soils and Hawaii's unique geology. He informed us of the harmful effects of lead, a main ingredient in batteries.
3. SCG made numerous phone calls and emails:
  - a. Linda Peters, Dept. of Environmental Management
  - b. John/Kiely, EnviroServices
  - c. Donna Alms, operations specialist West Hawaii Landfill
  - d. Steve Shock, Battery Solutions Inc., recycle batteries
  - e. Sharon Van Pelt, Customer Service Associate, Call2Recycle
  - f. Paul Buklarewicz, Executive Director, Recycle Hawaii

The group, service learning class and other KMS students, did battery **testing/sorting/counting**. SCG made sure ~1,000 batteries were done. SCG did ~30% of the testing/sorting/counting

SCG weighed batteries to determine number/lb. for each type. It's labor intensive to count each battery, we'll weigh rather than count the remaining batteries.

Misc. We:

-drafted letters to Hotels etc.

-scheduled field trip after spring break for the entire group.

-will testify at the Departmental of Environmental Managements Commission meeting on 3/23.

All publicity, data including survey results and spreadsheets have been documented and are available. These will be featured in our slideshow at our end of project celebration.

## **CITATION:**

## **Step 5: Analyze It!**

### **TASK**

How did it go? What did your team's testing reveal? Did your solution impact the problem it identified? Share what made your plan work (if appropriate); any challenges met along the way; how you overcame those challenges; and what adjustments were necessary. Would your team have done things differently if given the opportunity? If testing is still ongoing, share any results gathered so far.

Limit your response to 400 words.

### **TEAM RESPONSE:**

Our project isn't complete. Data so far indicates the project's success!

### **Pre-survey analysis:**

67% of the people surveyed don't take their batteries to the Hazardous Waste collection\*, 20% do\*\*.

\* Some people said they'd saved batteries but didn't know what to do with them

\*\* SCG noticed these were the "newcomers" who take the time to recycle.

However, 70% knew why batteries shouldn't go into the landfill, 19% did not. For those who responded, acid, chemicals, toxins and bad for the environment were noted as hazards.

88% said they would recycle if there were a local collection site.

### **Testing/Sorting Counting batteries analysis:**

The most common batteries collected were AA(55%) and AAA(23%). A large percentage of the batteries tested good, ~40%. This may indicate that most people don't realize that they're throwing away good batteries. This data is why we included tips for better battery usage in our flyers and presentations. This information may help decrease the number of batteries going into the landfill.

Juracell was the most popular brand found in the first ~1000. This information may help us when we work on encouraging businesses to be better recyclers of batteries.

### **Challenges:**

**Pre-survey:**

Group members didn't interview 10 each. Total surveys completed were 105. However, we feel we got a good variety of people.

**Locations:**

The bin inside the gas station had no batteries.

*We intend to:*

Relocate bins outside

Put bins in more locations (Not schools, it's unsafe for students to bring batteries.)

**Promotion:**

Thermometer went up late

Video Production class didn't complete PSA's

People may not pay attention to flyers or read the paper.

*We intend to:*

Radio PSA's

Flyers: door to door, put on car windshields, hand out at events

Sign waving

Make more presentations, especially schools

**Battery Counting/testing:**

We've collected ~2,000 batteries, only counted/tested ~1000.

Gloves uncomfortable/clumsy

Some testers have size limits

Ones with probes not as good

*We intend to:*

Weigh batteries instead of counting to make it easier

Don't test rusty batteries

**Miscellaneous.**

It's been a challenge working with a mix gender group.

It's also a challenge when your mom is the mentor.

**Conclusion:**

We feel our project is already successful; people have recycled batteries and are becoming educated on potential harm and better battery usage. We'll pursue recharging batteries as a potential business. We have information to start our lobbying efforts to encourage better recycling opportunities. Our project is easy to replicate.

We're helping our finite island home! We ARE changing the world!

**CITATION:**

## Step 6: Share It!

**TASK**

Now it's time to spread the word! Tell us what impact your project had on the local community, and how your team's newfound knowledge can be shared with others who want to make their communities a better place to live. What other kinds of communities might benefit from the team's conclusions? Be sure to explain how much time is recommended to complete the project, and what resources and materials are required.

Limit your response to 450 words.

**CITATION:**

**TEAM RESPONSE:**

Our post survey will give us a better idea of the projects overall impact on our community.

Our problem was lack of local recycling opportunities for household batteries in our isolated, rural community. By providing local bins we hope people will recycle batteries. So far the project seems to be effective. We've gotten a lot of comments about how cool the project is, how people have been wondering what to do with their batteries and from parents whose children were at our presentations.

We believe our project would work in other small towns, not only in Hawaii. Rural towns do not have opportunities bigger ones have. Our data shows people in general believe batteries are not good for the environment and would recycle them.

Our project is simple to replicate. Small towns in Hawaii tend to be close knit and caring, groups like the Lions Club; Boy Scouts etc. could easily do the project. There is not a lot of cost involved. Everyone uses batteries and they're relatively easy to collect and transport. Transportation to a recycle center is the biggest problem.

You would need a core group of people to put bins in central locations and have effective promotion. Sending home flyers with Elementary students was a great way to educate and involve families. The campaign should take a couple of months to make sure people know about it. If your campaign is successful you need to either:

- a. find some way to keep it going
- b. lobby government/stores for better recycling opportunities

According to our Office of Environmental Management, stores who sell batteries should help to recycle them. The government doing it will pass the cost on to the taxpayer. Perhaps the next step for anyone interested would be to lobby stores to collect them.

We have a unique situation in Hawaii, as we either need to fly or ship the batteries to the mainland for recycling which is costly. One idea we had is that most of our goods are shipped from the mainland and the ships go back empty. Why not send things that can only be recycled on the mainland, including batteries, in the empty ships? Our final analyses will give us needed information to perhaps lobby the legislature to look at this possibility. We are fortunate that our Senator lives in our town. We intend to speak to him once our project is completed.

There are many other opportunities this project has several are:

1. Do a Science fair project to asses if recharged batteries last as long as new ones.
2. Developing a recharging/reselling business.
3. Do more research on rechargeable batteries.

## Step 7: Attachments

### TASK

- You may include attachments to provide more information.
  - Up to 5 images (.jpg, .gif, or .png) or pdf or ppt
    - No files found.
  - 1 video - 1 minute or less (Videos will be reviewed for content, not the aesthetic quality of the video (.wmv, .mov, .flv))
    - [video 6000 n 60.wmv](#)
  - Website links - up to 5 links
    - No website links found.