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| C:\Users\bjaco\AppData\Local\Microsoft\Windows\INetCache\Content.Word\SLS-Teaching-Toolkit-Logo_Stacked-Initials.jpg | ReGenesis Case Study: Chemical Safety & Ethics in Relation to Communities |
| **Discipline:** Chemical Engineering | **Type:** Assignment; In-class Exercise & Discussion | **Time Commitment:** 1.5-2 hours | **Category:** Equity, Justice & Sustainability; Case Studies on Sustainable Communities; Community Health |
| **Big Ideas:** [Environmental Justice & Citizen Science](http://serve-learn-sustain.gatech.edu/big-idea/environmental-justice-citizen-science); [Participatory Processes & Collaborative Governance](http://serve-learn-sustain.gatech.edu/big-idea/participatory-processes-and-collaborative-governance) ; [Asset based community development](http://sls.gatech.edu/big-idea/asset-based-community-development) ; [Social and Environmental Determinants of Health](http://sls.gatech.edu/big-idea/social-and-environmental-determinants-health) ; [Collaborative Community Innovations](http://sls.gatech.edu/big-idea/collaborative-community-innovations) |
| **OVERVIEW:**This tool explores the principle that environmental health impacts are a function of the inherent risk multiplied by exposure. In chemical processes we have become better at managing inherent risk, but we also have a significant legacy of mismanagement. One such example occurred in Spartanburg, South Carolina, where local politician Harold Mitchell and community organization ReGenesis tackled the problem of their community's long-term exposure to hazardous waste. The tool below uses a video of Rep. Mitchell to explain the events in Spartanburg. It explores how local chemical plants mismanaged and deliberately covered up risks, nearly leading to a chemical disaster that they were not equipped to contain. Through this activity, you will explore and discuss how chemical engineering professionals should respond to similar situations, and what responsibilities such professionals have to the communities around them.This tool was contributed by Matthew Realff. Consider pairing it with another SLS tool, [ReGenesis Case Study: Creating a Sustainable Community through Collaborative Problem-Solving](http://serve-learn-sustain.gatech.edu/regenesis-case-study-creating-sustainable-community-through-collaborative-problem-solving). |
| **INSTRUCTIONS (3 possible routes):** 1. Access [this 1-hour video](https://smartech.gatech.edu/bitstream/handle/1853/56518/mitchell_videostream.html?sequence=2&isAllowed=y) of Representative Mitchell from South Carolina.
2. Use this tool as an in-class activity. 45-1 hr.
* Introduce Risk = Hazard x Exposure.
* Screen each clip (as instructed below) and then ask students the associated questions.
1. Use this tool as a take-home assignment. 30 min.
* Ask students to follow the instructions of the activity below.
* Make sure to plan to discuss their answers in class, as this tool is much more successful when there is a discussion component.
1. Use this tool as a mixed take-home and in-class assignment. 30 min
* Ask students to watch the video at home.

Discuss the questions on the activity in class. |
| **SLS STUDENT LEARNING OUTCOMES & ASSESSMENT** The Serve-Learn-Sustain toolkit teaching tools are designed to help students achieve not only SLS student learning outcomes (SLOs), but the unique learning outcomes for your own courses. Reflection, concept maps, rubrics, and other assessment methods are shown to improve student learning. For resources on how to assess your students’ work, please review our [Assessment Tools](http://serve-learn-sustain.gatech.edu/tool-category/assessment). **This tool achieves SLO 3. See the end of this tool for further details.**  |

**Want Help?**

Matthew Realff is the contact for this tool. You can reach her at matthew.realff@chbe.gatech.edu

ReGenesis Case Study: Chemical Safety & Ethics in Relation to Communities

**Instructions**

This tool explores the principle that environmental health impacts are a function of the inherent risk multiplied by exposure. In chemical processes we have become better at managing inherent risk, but we also have a significant legacy of mismanagement. One such example occurred in Spartanburg, South Carolina, where local politician Harold Mitchell and community organization ReGenesis tackled the problem of their community's long-term exposure to hazardous waste.

The tool below uses a video of Rep. Mitchell to explain the events in Spartanburg. It explores how local chemical plants mismanaged and deliberately covered up risks, nearly leading to a chemical disaster that they were not equipped to contain. Through this activity, you will explore and discuss how chemical engineering professionals should respond to similar situations, and what responsibilities such professionals have to the communities around them.

1. Read the paragraph below on **Risk = Hazard x Exposure**
2. Access [this 1-hour video](https://smartech.gatech.edu/bitstream/handle/1853/56518/mitchell_videostream.html?sequence=2&isAllowed=y) of Representative Mitchell from South Carolina. Rep. Mitchell gave this seminar on the ReGenesis Project during a visit to Georgia Tech in Spring 2016.
3. Following the instructions of the sections below, beginning with **"Start right where you are,"** watch each video segment and answer the associated questions.

**Risk=Hazard x Exposure**

The products we have come to rely on are manufactured from materials that often involve the use of chemicals. Many of these chemicals are inherently toxic to humans, toxic to other species, and/or flammable. When working with these inherently hazardous materials, we should consider whether we might create environments where

1. We can become exposed to these chemicals.
2. These chemicals can be released into the environment.
3. These chemicals can ignite.

Thus, our risks are the multiplication of the inherent hazard of these chemicals, and the probability of their release.

However, we rarely think about how this risk is distributed over the various communities that might be exposed: the inherent risk affects us all equally, but we are not all equally exposed. In fact, the exposure is very unequally distributed across society. Often poor, disenfranchised communities exist near sites of chemical manufacturing, storage and disposal. Sometimes these hazards are introduced to a community that has existed for years; other times, communities develop around these sites because they provide a source of economic activity and employment. In either case, the exposure is concentrated in these communities and the health impacts can be significant.

Thus, when we consider the risks associated with things like chemical plants, we must multiply the inherent hazard of the chemicals with the likelihood of certain community's exposure to those chemicals. Only then can we approach a clear understanding of the risks involved.

**“Start right where you are”**

*View Rep. Mitchell’s presentation from Minute 8 to 12:50*

Consider the different impacts of the chemical facility on the surrounding communities. List as many different impacts as you can and associate each impact with a specific type of person, e.g. resident, facility employee, etc. Do not just list negative impacts; also consider any positive impacts that you hear about. Identify any tradeoffs between impacts.

“Chemical Risk” is the inherent hazard to a subpopulation of the chemical multiplied by the probability of exposure of that subpopulation.

1. What specific types of subpopulations are likely to have higher inherent hazards?
2. As described in the video, what subpopulations have been exposed in this case, and what are the consequences?
3. How would you respond if you were the plant manager?

**Fairburn Creek - “Now this is the sulfur”**

*View Rep. Mitchell’s presentation from Minute 14:07 to 18:02*

The company described in this clip is one that you could easily work for as a chemical engineer. In light of this:

1. What is your reaction to this information?
2. Why do you think community members didn’t complain?
3. What is the property owner trying to hide?
4. Historically what has been unofficially sited there?
5. “Illegal dumping” has plagued communities throughout history. What type of community typically suffers the most from illegal dumping? What laws exist to protect communities from this type of activity? By whom and how are those laws enforced?

**“This is the target area”**

*View Rep. Mitchell’s presentation from Minute 31:44 to 34:45*

1. Explain why zoning can be an important element of protecting communities from environmental harm.
2. What was the problem with emergency access?
3. Give a brief account of the causal chain that could have led to a major explosion at the facility. Identify the chemicals involved and provide data on their explosive limits and potential.
4. Identify the resources available to deal with the danger. If they are inadequate, why do you think more resources were not made available?

*View Rep. Mitchell’s presentation from Minute 51:04 to Minute 52:29*

1. Are you convinced that the problem with emergency access has been resolved? What further steps would you recommend?
2. Are you convinced that the situation is being managed appropriately? What other procedures and resources would you recommend be put in place and made available?

**“Alone we can do so little, together we can do so much” – Helen Keller**

*View Rep. Mitchell’s presentation from Minute 1:00 to 1:03*

Reflect on Rep. Mitchell’s closing remarks and write a couple of sentences about how you should behave as a chemical engineer. Ask yourself:

1. What are your responsibilities to the community in which you are working?
2. Are your ethical responsibilities different when the community is disadvantaged/low income/without equal access to resources and power in decision making? How and why?

**Further Reading**

Joseph V. Rodricks, *Calculated Risks, The toxicity and human health risks of chemicals in our environment*, Cambridge University Press, 1992.

SLS Student Learning Outcomes

1. Identify relationships among ecological, social, and economic systems.
2. Demonstrate skills needed to work effectively in different types of communities.
3. Evaluate how decisions impact the sustainability of communities.
4. Describe how to use their discipline to make communities more sustainable.\*

\* *Note:* SLO 4 is intended to be used by upper division, project-based courses such as Capstone.