The disaster: The limnic eruption. A huge release and overturn of submerged gasses in a body of water that release and asphyxiate/burn anything caught in its way. This disaster is rare, hard to detect against, and effects only a small group of people, all of whom must live near a body of water, and one that accumulates gasses. Unfortunately, this event can be triggered by other disasters, like earthquakes and volcanic activity.

Target group: I chose those in and around limnically active/exploding lakes, focusing more on first responders, and those who give aid. So far, accounts of such eruptions are devastating and mainly second hand as survival rates of this type of disaster are very low. Most aid would come during the aftermath, as it can be difficult to predict the event, so warning systems are a waste of time. Search and rescue is very dangerous and would require improvement of personal environmental protection, possibly in the form of redesigned wearable tech and some form of self-contained evo suit.

Active lakes: Lakes Monoun, Nyos (both Cameroon), and Kivu (between Rwanda and D.R. of Congo).

Insights: The insights I’ve made from delving deeper into explosive lakes has made me aware of a few things. Active locations, preventative measures, and an idea for rescuers, based off the mechanics of the disaster.

Prevention: A research team lead by Michel Halbwachs developed a prevention system to reduce the risk of overturning (the process by which the lake explodes). It involves the placement of vertical pipes that siphon the dissolved gasses from the water, like pumps. The dissolved solution safely explodes from the pipe like a fountain. This method successfully rendered Lake Monoun safe (one of 3 known limnic lakes). The issue here is cost as you not only need to build several siphons to keep the gas level safe, but these pipes require maintenance as these lakes are acidic, corroding the pipes.

Rescue: I have not seen much of an effort made for active rescue, just post-operation triage, due to the level of risk of the disaster, the difficulty in prediction, and no available warning system. There are existing technologies for personal protection in hostile environments (ex. SCBA), but they vary in effectiveness, cost, and utility.

Concept/concept system: Below is an example of the aftermath of a large limnic eruption, suffocating anything in its wake.

Due to the deadly environment and lack of a solidified disaster plan, my idea is a two-part system, pre and post-op. First, pre-op, which works to prevent the disaster outright and warn those around in case of emergency. Second, post-op, works to control the damage by providing search and rescue, and other forms of aid. My technological focus will be the tools that rescuers use, and improvements/new concepts I can make to improve the response systems and/or equipment.
Pictured above is a diagram and image of how the vertical siphons function and what it looks like while implemented.

Pictured below is a draft of a personal protection environmental suit for a first responder:

Prevention:
So far, I have been gathering information regarding what, if any, things have been done in the past when looking at limnic eruptions specifically, and any other disasters relating to mine, in regard to first responder safety, and aid. My research lead me to discover a preemptive method discovered and implemented by a research team in Cameroon that works successfully in reducing, even completely removing, the risk of an explosive lake overturning.

Equipment & Safety:
I also considered existing technologies first responders use when faced with a disaster. Mainly looking at firefighters as they handle dangerous environments and extreme conditions daily, and what they might do in a similar situation. I analyzed what physical equipment they use, suits and breathers, such as the self-contained breathing apparatus (SCBA, or when underwater SCUBA), and how they work and what conditions they are used for. Leading me to think about improvements I can drum up and imagine, for my own concept implementation.

Conclusions:
Developing an active alarm system that monitors the status of the environment is difficult and I think not worth the time investment. However, preventative measures must not be ignored, especially after reading about the de-gassing method (mentioned above, shown right). Pairing this with the proper aid and rescue plan, as well as equipment for the job, is paramount, and what I will focus on within the concept portion of the project.
Primary Attributions

Secondary Attributions
image: Lake Nyos (source: https://upload.wikimedia.org/wikipedia/commons/4/41/Lake_nyos.jpg @9/18/17).
image: Lake Nyos Cow Killed (source: https://upload.wikimedia.org/wikipedia/commons/c/c2/Cow_killed_by_Lake_Nyos_gasses.jpg @9/18/17).
image: Describes de-gassing Nyos (source: http://www.geo.arizona.edu/geo5xx/geos577/projects/kayzar/assets/images/degassing_lake_nyos.jpg @9/18/17).
source: Natural disaster general info (source: https://en.wikipedia.org/wiki/Natural_disaster @9/18/17).
source: Limnic Eruption general info (source: https://en.wikipedia.org/wiki/Limnic_eruption @9/18/17).
source: Space suit general info for dev of evo suit (source: https://en.wikipedia.org/wiki/Space_suit @9/18/17).