Grassroots Emergency Communications Operations

Sticky Notes

GECO Newsletter
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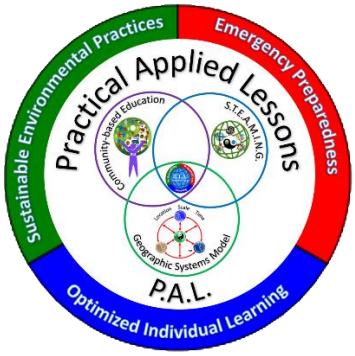
www.neighborhoodlink.com/GECO Email: gecoradio@gmail.com

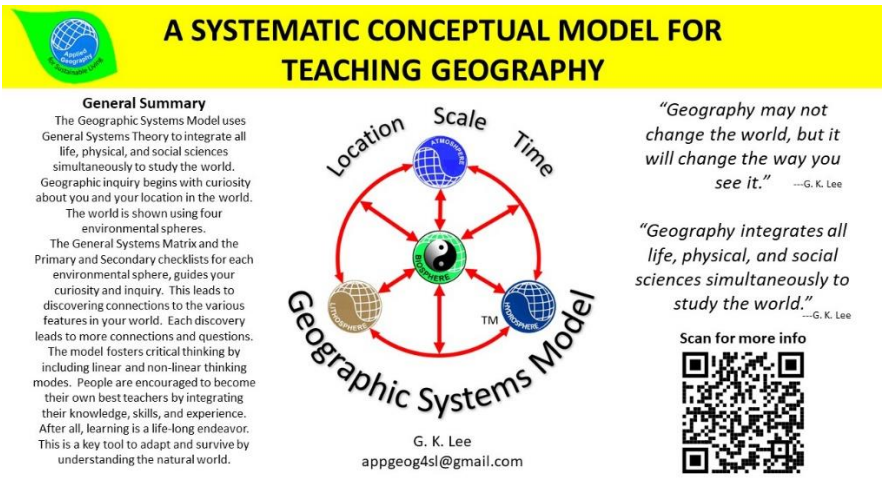
Ready to Serve and Sustain Our Community

Our Commitment to Quality Practical Applied Lessons

GECO works closely with Applied Geography for Sustainable Living (AppGeog4SL). We develop Practical Applied Lessons (P.A.L.) using the GLS Community-Based Education Model (C-bE), the S.T.E.A.M.I.N.G. curriculum schema, and the Geographic Systems Model (GSM). Last month, AppGeog4SL submitted a virtual poster for the Association of American Geographers 2021 Annual meeting featuring the Geographic Systems Model. The GSM is presented as a conceptual model for teaching Geography.



For GECO, the GSM is applied to emergency preparedness (EmPrep) and emergency communications (EmComm). For EmPrep, our focus is a grassroots program of Geo-Hazards awareness to directly support the UN Sendai Framework for Disaster Risk Reduction. For our EmComm work, the GSM is used to plan field operations, determine LOS (Line of Sight) maps for RF networks, and Geo-Hazards for operational planning.



Many people do not study or have a chance to study Geography. The GSM virtual poster is an introduction to a very practical way to learn geography. Scan the QR code shown in the illustration above. It will link you directly to the GSM paper. It is a compact self-learning introductory course in Geography. It uses the diagram of the GSM (central diagram in the poster above). In the paper, are a series of General and Detailed checklists for each of the environmental spheres. Follow the checklists to learn about your local environment in terms of the environmental spheres while applying the concepts of Location, Scale, and Time.

GECO is committed to using the GLS Community-based Education (C-bE) methods to develop training programs suitable for elementary school to post-graduate/adult levels. The idea is to give

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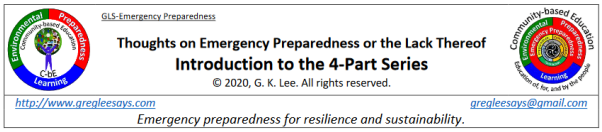
learners the chance to use classroom knowledge and lessons to build community disaster preparedness and disaster resilience. Learning activities tend to be outdoor collaborative community-service projects.

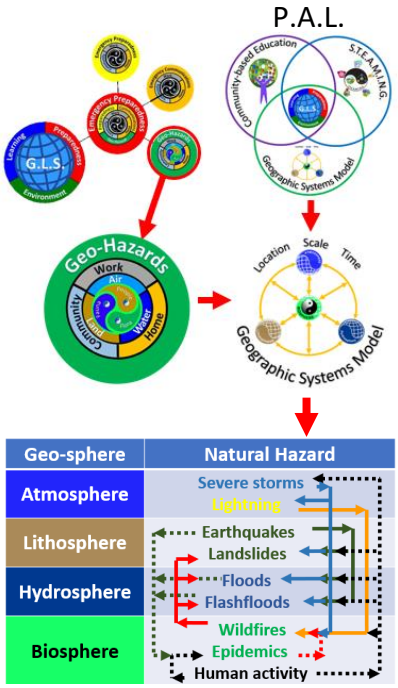
Last month, the UN issued a report warning many dams around the world are approaching 100 years old or reaching their 50-year design age limit. Proximity to dams upstream are one of the geo-hazards included in the Grassroots Emergency Communications Operations (GECO) Emergency Preparedness "Plan Your Own Rescue" program. This series is a grassroots effort in support of the UN Sendai Framework for Disaster Risk Reduction (DRR).



The series has an Intro and 4 parts (1, 2, 3, 4)

Part	Contents	
Part 1 of 4 Past Disasters	Counter-Productive Government Assistance	
	Public Perception of Risk	
	Preparations for Disasters	
	Evacuation Orders	
	Reactions to Disasters	
Part 2 of 4 Raising Geo-Hazards Awareness	An Overview of Vulnerable Populations	
	Grassroots vs. Government Assistance	
	You're On Your Own (YOYO)	
	Improving Public Awareness of Risks	
	What Are Your Local Geo-Hazards	
	Teach People to Use the Geographic Systems Model	
	Local Geo-Hazards Mapping	
	Priorities of Local EmPrep Mapping	
	Landing Zones (LZ) and Ground Transportation	
Part 3 of 4 Preparedness Learning	Individual vs. Group(s)	
	You Must Set Clear Priorities	
	What to Prepare?	
	General Tactics Before a Disaster	
	Personal Emergency Pack (PEP)	
Part 4 of 4 Survival Priorities	How Long to hold out?	
	First Steps in a Disaster	
	Emergency Toilet	
	Attitude is Everything	
	Non-Radio EmComm	Ground to Air
		Ground
	Getting attention at a Distance	

The diagram on the right shows the GLS organization (left upper left circle) and its Preparedness Division (red circle) and its three sections (Geo-Hazards, EmPrep, and EmComm). The Geo-Hazards section (green circle) uses the Geographic Systems Model, and the Practical Applied Lesson (P.A.L.) process to create the lessons for people to become aware of their local Geo-Hazards.



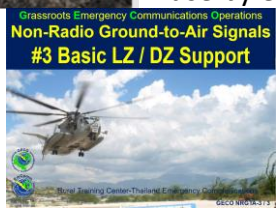
The color-coded table (bottom right) links the different geo-hazards to the environmental spheres of the Geographic Systems Model. Some of the geo-hazards are inter-related. For example, floods are in the Hydrosphere, but involve the Lithosphere. Heavy rain can be a water source for the flooding. However, earthquakes (Lithosphere) and landslides can create situations contributing to flooding. For example, in Thailand, the 2011 floods involved heavy rainfall which threatened to overtop dams. Landslides blocked some streams and rivers. Both these contributed to the flooding.

Interested groups (e.g., teachers, schools, community groups, businesses) may contact gecoradio@gmail.com to discuss training workshops or to develop training programs applying the GSM to their needs.

New Non-Radio EmComm Lesson

NRGTA-1

NRGTA 2

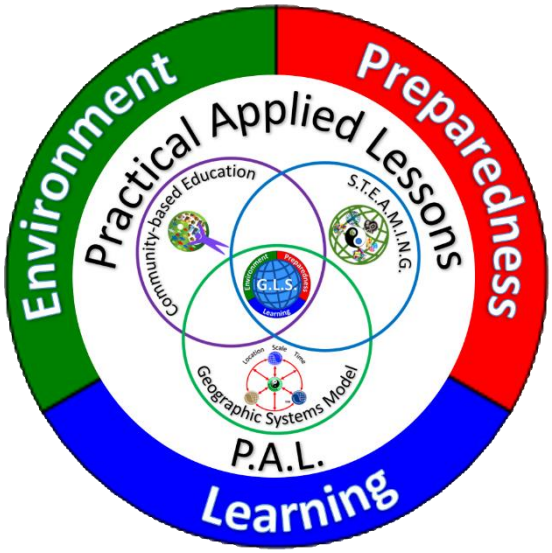


NRGTA-3

We compiled this presentation from notes and newsletter articles we published in the past (e.g., WARC "Footprints" and GECO "Sticky Notes). Non-Radio EmComm Ground Signaling Methods complements our 3-part lesson series on Non-Radio Ground-to-Air Signals (2013).

Together, these lessons fit into the overall emergency preparedness / emergency communications lessons and activities for our Next Gen EmComm and building community disaster resilience and sustainability efforts.

All GECO lessons/activities are intended for use by elementary school students. The main idea is for students to apply abstract, academic classroom lessons to complete practical community-service projects. This would be a low cost/no cost, low tech/no tech approach to improve public school education and build community capacity for disaster preparedness and resilience.



The Practical Applied Lesson development schema.

These lessons do not negatively impact existing school curricula. GECO uses the GLS Community-based Education (C-bE) method to create Practical Applied Lessons (P.A.L.). Lesson activities are linked to S.T.E.A.M.I.N.G. (Science, Technology, Engineering, Arts, Mathematics Integrating Nature and Geography; the GLS adaptation of STEAM curriculum criteria).

International disaster relief organizations and experts see the 21st century as being one of mega-disasters. Governments and international disaster responders will be hard pressed to serve the people in disaster areas. The farther a community is from a major population center, the longer it will take relief to arrive. Building local disaster preparedness, resilience, and emergency communications capacity are fundamental to community sustainability.

Non-Radio EmComm ground communications methods are low cost/no cost, low tech/no tech methods for poor impoverished remote communities to attempt to signal relief teams. Every method has limitations; no one method is 100% effective. A good approach is to select 1-3 appropriate methods each for day and night signaling. Getting students involved lets them put their classroom lessons to practical use for the community.

Dynamic EmComm Interoperability

Most discussions of interoperability focus on equipment and hardware. There are lots of information about equipment and hardware interoperability. A key decision is to standardize the key pieces of equipment: radios, antennas, batteries, battery chargers. The big advantage is the ease of programming frequencies and swapping equipment between operators. The main disadvantage is a fault or flaw might render all similar units inoperable. On the other hand, having a diversity of equipment eliminated the chance that all radios are affected by a flaw or fault in a particular brand. However, interoperability may be hampered if operators need to use unfamiliar equipment. Whatever the case, be sure to have the appropriate jumpers/adapters to connect various radios to various antennas and chargers in your EmComm group.

Equipment
Radios, batteries, chargers, antennas, cables, connectors, etc.

Training
EmComm Radio Protocols
Team Organization
In-Place/Evacuate Protocols

In times of emergencies, any and all means of communication should be used. In most countries, there are more smart phone users than licensed EmComm HAMs. In 2017 we wrote an article suggesting EmComm teams should consider recruiting non-HAMs with smart phones using walkie-talkie apps. This could also be a way to recruit new HAMs for EmComm. We've worked with Zello. It has the capability to create "private groups" so members of an EmComm Team can have secure communications. Zello uses a PTT so it's good practice for HAMs who don't have radios. They can practice proper radio procedures and protocols via VOIP and not worry about on-air violations or errors. Non-HAMs get to experience EmComm and the HAM community. This could lead to them becoming HAMs. If nothing else, it builds local EmComm capacity. In many areas of South and SE Asia, there are many HAMs who cannot afford radios but have smart phones. Using smart phone VOIP apps lets them become active EmComm operators.

Some Walkie-Talkie Phone Apps

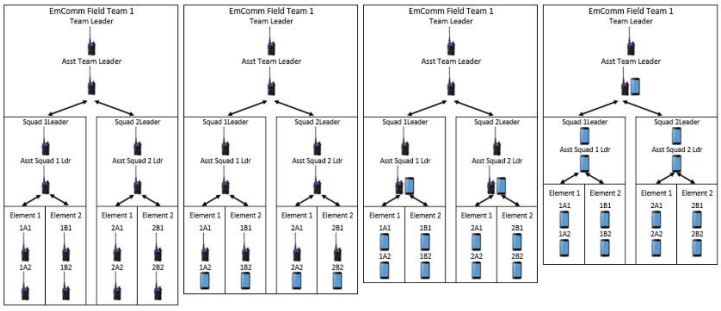
The table on the right summarizes the GECO EmComm Field Team format. Their primary function is to recon the scene and report to Net Control. Of course, you are free to modify and adapt this to suit your local conditions and circumstances.

Safety is paramount. You cannot observe and report if you are injured or incapacitated. Work in pairs; avoid working alone. There is safety in numbers. All Element members must be prepared to serve as "runners" to hand carry messages if other communication methods fail.

EmComm Field Team
A Field Team has at least 2 squads; Each squad has at least 2 elements.
This calls for a minimum of 14 people.

Position	Primary / Secondary Functions		Notes
Team Leader	• Talks directly with Net Control. • Relays traffic to/from Asst Team Leader		General Operating Rules • Work in pairs; avoid lone operating. • Team Leaders must be in RF range of Net Control. • Squad Leaders must be in RF range of Team Leader. • Elements must be in RF range of Squad Leader • Before deploying to the field, all team members must write down Net Control primary and secondary frequencies.
Asst Team Leader	• Talks directly with Team Leader • Relays traffic to/from Squad Leaders		
Squad Leader	• Talks directly to Asst Team Leader • Relays traffic to/from Asst Squad Leader		
Asst Squad Leader	• Talks directly to Squad Leader • Relays traffic to/from Element Members		
Element Leader	• Talks directly to Asst Squad Leader • Supervise/Mentor Element members	All Element members • hear traffic from Asst. Squad Leader • Recon & Report to Asst Squad Leader • Serve as Runners as needed.	
Asst Element Leader	• Learn from Element Leader • Recon (Observe & Report)		

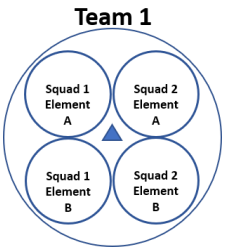
Advancement follows the stepwise rise upward from Asst. Element Leader to Team Leader based on competent performance of job functions (not necessarily longevity of service), effective leadership and decision-making. Safety is paramount. If you are not safe and are injured, you won't be able to help others.



GECO advocates using a mix of radios and smart phones with walkie-talkie apps (set to a private channel). This is especially helpful in situations were there aren't enough radios to go around. The diagram at the right shows a variety of scenarios ranging from an all-radio team (left, requiring 14 radios) to a minimal radio team (right, requiring 1-2 radios; the Asst. Team Leader may or may not have a radio). You can easily see the advantage of this mix. Even with only 1-2 radios, you can still field a team of 14 pairs of eyes doing recon/reporting work in the disaster area.

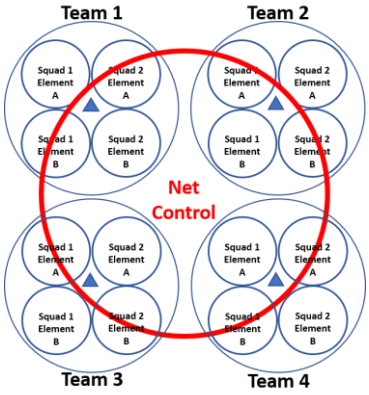
Another key adavantage is the basic simplicity of relaying reports to Net Control. The pattern is similar all the way from the Element level to the Team Leader. Once a person is trained at the Element level, the key functions of observing and reporting use the same HAM radio controlled net protocol. With time under good leaders, effective mentoring, members begin to acquire experience and effective decision making. This uniform training means team members are more readily swapped between teams as needed. For example, if the need arises, people from any Element, Squad, or Team can be reassigned to replace or reinforce another Team, Squad, or Element.

The diagram on the right shows the team deployment in the field. All squads must be in range (RF or cell phone) of the Team Leader. This requires the team to quickly assess cell signal strength (see p. 3 in the link) once on site. If there is no cell service, the Team Leader notifies Net Control and limits the recon/reporting to a reasonable distance based on the Team's resources (e.g., RF if each squad has a radio, or a combination of RF and runners). Flexibility is the key. [**Note**: The human interoperability relies on training. Each Team member needs to cross train as much as possible. This gives Team Leaders the option to re-assign team members as needed by the situation on site.]



All squads must be in RF range of the Team Leader (blue triangle).

The diagram on the rights shows the arrangement of a group of Teams connected to a Net Control Station (center of the red circle). This is ideal. Realities of terrain and operating conditions may make it difficult to have such a symmetrical pattern. When first arriving on scene, Team Leaders must assess the situation, find an operating location in RF range of Net Control, set squad operating range, and inform Net Control.



Team Leaders (blue triangles) must be in RF range of Net Control.

Personal safety is number one. All team members must be alert to dangers and hazards that pose a threat to the Team or Elements. Each Team must set regular check-in times for all Squads, and a regular check-in call to Net Control to report overall Team status.

Every emergency incident will be different. The number one reason for EmComm failures is being confronted with unexpected situations. Look at the geo-hazards for your area and brainstorm all possible scenarios that could disrupt your operating capabilities. Then remember Murphy's Law: "When everything is going well, you've obviously overlooked something."

If you haven't already done so, set a specific time and frequency aside for "Listening" for stations who are limiting transmissions to save power.

EmComm Emergency Navigation

Imagine a natural disaster (e.g., major storm and flooding) hit your area. Cell phone and data/Wi-Fi service are knocked out. Many familiar landmarks and roads are underwater. As an EmComm operator, how can you accurately navigate and report to Net Control?

The image on the right is of the area around Ambalapuzha, Kerala, India. The two images below are NASA Landsat images showing the same area before (2018 Feb 6) and after flooding (2018 Aug 22). If you had a local road map, you recognize some of the major roads and waterways in the before and after images.

But you would be hard pressed to know an exact location in some of the flooded areas (dark blue in the image on the far right).

Without getting overly technical, consumer GPS units can vary in accuracy by 3-30 m. It depends on the GPS unit, where you are (e.g., under trees, near tall buildings, canyon walls, etc.) and other technical factors. For many casual users, the datum, geoid of reference, etc. are unknown variables that affect the displayed location data. We assume most people using a consumer-grade GPS simply turn it on, capture their location, and report it. Most GPS units do not need the Internet or cell phone signal to work. This is a big plus in a disaster scenario when power, internet, and cell service isn't working.

Two free phone apps are available for use: what3words, and Navmii. The location accuracy for what3words is 3 m. What3words locations are developed based on assigning a unique combination of three words to identify 3m x 3m grid squares in a world-wide grid. It is available in 43 languages. Navmii is a free mapping app that works with inputs from what3words.

We suggest EmComm HAMs get and use what3words for locations. These apps can work even if there is no cell or data signal. Your phone just needs to see the sky to get a GPS satellite signal. It's easy and doesn't require you to know the technical details of GPS. You don't need to know about latitude/longitude format types or the geographic grid system. What3words uses three simple words to specify a 3 x 3 m location.

You can also use what3words can navigate when there is no cell or data signal. If you know the what3words location for your start and ending points, it tells you direction and distance to a destination. But no map is displayed. Navmii is a free app that works offline with what3words to give you turn-by-turn navigation.

Before a Disaster: The ideal situation is for ALL EmComm team members to know how to use these location and navigation tools in an offline mode. Giving what3words locations is less prone to error than transmitting numerical coordinates. Transposing errors in what3words are more readily detected than transposing numbers in latitude/longitude coordinates.

Step 1: Download / install what3words and Navmii on your smart phone. Get familiar with using them. Do this for everyone on your EmComm team.

Step 2. Get the what3words locations for your station, Net Control, and other relevant locations in your EmComm plan (e.g., shelters, alternative operating sites, key road junctions, bridges, relief supply routes, possible helicopter landing zones, etc.).

Step 3. Know your local geo-hazards and the susceptibility of your EmComm operating positions, evacuation / supply routes, and other emergency facilities. These should be monitored during an emergency.

[**Note**: Be sure to advise all local emergency responders that you will be using what3words in your EmComm operations. Encourage them to do the same. What3words locations can be converted to latitude/longitude coordinates. As backup, be prepared to do this as most air navigation systems use decimal latitude/longitude coordinates.]

How can they know where they are?

Advantages of this Emergency Navigation Method:

1. Little to no technical knowledge of geography is needed.
2. Locations are specified using three common words. There are 43 languages used, so non-English speakers won't need to learn a foreign language.
3. What3words was developed to give unique location information for areas without clear signage or specific street addresses. This makes it ideal for use in EmComm. Natural disasters can wipe out familiar landmarks, street signs, etc.

Possible Disadvantage: What3words may not be used by emergency services in your area. If that is the case, take some time to introduce it to them. Point out that more emergency services, transportation and delivery services and people are using it. Point out the advantages of using it.

Get it taught in local schools: As with many of our emergency preparedness and emergency communications lessons and activities, get schools to teach what3words to students. Just as they are taught to dial 9-1-1 (or your local emergency call number), students should be taught to use what3words so emergency services can quickly and accurately know their location.

For practice, get students to make maps of their school, local parks, and playgrounds, etc. It is good practice to combine map making with other classroom lessons linked to science and math. Many people living in remote, rural, or less developed areas lack good maps. While student mapping efforts may not fully meet cartographic standards, a first cut rough map is a start when there is no map at all. In the information / digital data age, if they don't show up on a map, the people are not counted in the national tally of statistics and may be marginalized or cut off from vital government services. In emergency situations, knowing and reporting your location can make the difference between life and death.