# Field Preparation Guide for the Department of Earth, Environmental, and Planetary Sciences

BROWN

Department of Earth, Environmental and Planetary Sciences

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### Intention

The aim of this field guide is to provide Brown University students with useful information for conducting field research. This guide was developed by students in the DEI in STEM Seminar (EEPS 2910), instructed by Dr. Emily Cooperdock. We have compiled relevant resources and advice for the broad range of field work done in the DEEPS community. This is necessarily not an exhaustive compilation as all field science has its own unique challenges, but we hope this can be a general guide for personal preparation as you plan to enter a new environment, working with a team of scientists, and accomplishing your research goals. In particular, we avoided scientific gear suggestions as that will vary greatly based on the kind of field work you plan to undertake. Instead, we provide lists of helpful questions and resources to guide you through your own research about your trip and fill in information that is often excluded from traditional field guides. In this way, we hope to "level the playing field" for scientists without outdoor or field experience so that they are able to achieve their research goals ethically and with appropriate expectations of their trip.


Generated by Julia Miller, Alexia Rojas, Ellen Jorgensen; 2024.

1. Introduction to field work

**What is field work?**

**Earth science fieldwork** is the practice of **collecting, observing, and analyzing data from natural environments to study Earth's physical, chemical, and biological processes**. It encompasses multiple disciplines, including geology, hydrology, geophysics, oceanography, and environmental science. [1-5]

**Why is field work important?**

Field work is used to answer Earth and environmental science questions that require sample collection, in situ measurements, mapping, outcrop or environmental observations, equipment setup, community engagement, etc. It allows us to:

- Ground truth remote data [6]
- Collect/extract samples for future analysis
- Observe geologic and environmental processes in situ [1]
- Assess natural hazard risks such as earthquakes, floods, fires etc. [7]

**What are some barriers to field preparedness?**

There are several kinds of barriers to field preparedness, including logistical, financial, educational, and social/cultural barriers. Logistical barriers can include access to remote locations (difficulty obtaining permits, extreme environments), lack of equipment and time constraints (weather conditions, time off from work). Financial barriers include the cost of field campaigns and lack of grant or institutional support. Educational and training barriers can include a lack of scientific training, prior field experience, and safety/risk management training. Additionally, many social and cultural barriers exist for those from underrepresented groups and people with disabilities [8,9].

**1. Coe, A. L. (2010).** *Geological Field Techniques.* Wiley-Blackwell.
**2. McClay, K. R. (1991).** *The Mapping of Geological Structures.* Wiley.
**3. Frodeman, R. (1995).** "Geological reasoning: Geology as an interpretive and historical science." *Geological Society of America Bulletin, 107*(8), 960-968.
**4. Kirchner, J. W., Finkel, R. C., & Riebe, C. S. (2001).** "Measuring rates of landscape change." *Annual Review of Earth and Planetary Sciences, 29*, 577-617.
**5. Pipkin, B. W., Trent, D. D., Hazlett, R. W., & Bierman, P. R. (2010).** *Geology and the Environment.* Cengage Learning.
**6. Cawood, P. A., & Bond, C. E. (2019)**. "Earth Science Fieldwork: Past, Present, and Future." *Geology Today, 35*(1), 34-40.
**7. Bierman, P. R., & Montgomery, D. R. (2014)**. *Key Concepts in Geomorphology.* W. H. Freeman.
**8. Carabajal, I. G., Marshall, A. M., & Atchison, C. L. (2017**). "A synthesis of instructional strategies in geoscience education literature that address barriers to inclusion for students with disabilities." *Journal of Geoscience Education, 65*(4), 531-541.
**9. Clark-Ginsberg, A., McNeil, S., & Kluttz, T. (2020)**. "Field research safety: Adapting risk assessments to security realities." *Journal of Risk Research, 23*(3), 355-371.

## 2. Questions to ask your trip organizer

### Logistics

- How many nights are you going to be traveling for?
- Will you be staying in tents? Hotels? Are you expected to share with someone?
- Will there be restrooms/potable water/stores accessible from where you are staying?
- What field equipment will you be responsible for bringing and carrying?
- What is the weather usually like during the season you're traveling?
- What kind of food can you expect to be available? How often will you have meals?
- If you are bringing your own food, will there be any means of refrigeration? A communal cooler?
- If cooking in the field, what equipment will be available? What will you need to bring with you besides the food?
- Do you need a visa?
- Do you need special vaccines to travel to this region?
- What gear do you need to buy, and what gear can you borrow (either from the department or from peers)?
- Will you have cell service? If so, how reliable is it?
- Will you have access to the internet? Do you need to purchase an international data plan?
- Will there be access to electrical outlets? Do you need backup battery packs or adapters?
- How rugged is the terrain going to be?
- What vehicle are you traveling with? Are you prepared for basic maintenance and fixes? Are you expected to drive?
- What should you expect in terms of hiking distances and required physical tasks?
- Do we have appropriate permits to access our field sites? Who is the point of contact for the permits and do we need to report to them?
- Do we need to ship equipment to the field site? Will we need to ship equipment and samples from the field site to home? What supplies do we need for this? What are the laws around shipping materials across state or national boundaries?

### Research

- What are the academic/professional goals of this trip?
- What deliverables does your trip leader expect from you during/after the trip?
- What skills will you need to know to perform the planned field work (eg: using a Brunton compass, coring, sample identification, sample retrieval), and how can you practice?

- Who is participating on the trip (traveling with you or locally), and what are their roles and responsibilities?

## Regional Culture

- What is the regional language? Are you traveling with someone who speaks it?
- Is the place you're going sacred or culturally significant to the people who live there?
- What is the colonization and indigenous history of the land?
- What kind of government, local laws, or customs exists in the region?
- Are there local customs, gender roles, or other cultural sensitivities that the group should be aware of? How will it be navigated?
- Who owns the land you are working on (i.e., private vs. public access, indigenous, federal, etc.)?

## 3. Packing for your trip

The intent of this section is to provide advice on how to develop a personal packing list. We intentionally avoid research-specific items since they will vary significantly depending on the purpose of the trip. You should ask the trip leader for a specific packing list for your trip. Here, we focus on common things to help people stay safe and comfortable while camping and doing field work. A packing list may also be informed by answers to questions from the previous section. If you do not have your own gear, we recommend checking with friends, your research team, or your department for gear you can borrow or rent.

### General Packing Tips for Field Work:

- If you are planning to order any new gear, leave sufficient time for it to be delivered before you depart.
- Pack clothing that can be layered.
- A portable phone charger is good to have, especially if you're also planning to use your phone as a flashlight.
- A headlamp or flashlight is essential for camping (and generally just existing) after dark. Don't forget extra batteries.
- Bring granola/protein bars (or some non-perishable food source to have on you, even if food will theoretically be provided).
    - BUT be sure to follow rules about food storage where health and safety are a concern (in places where there are bears, etc).

### Weather-Related Tips:

- Check local climate/weather before your trip, but also keep in mind that weather can be unpredictable.
    - Always be prepared for rain and cold, even if not specifically forecast!
- Dealing with hot weather:
    - A thermos will keep water cold for a lot longer than a plastic water bottle. Having only warm water to drink can be unpleasant.
    - Wide brim hats, light clothing layers, and UV protection shirts can be helpful (in addition to regularly applying sunscreen!) for preventing sunburn.
    - In extreme heat, make sure to drink water regularly, even if you don't feel thirsty.

        - Sports drinks are also good to have on hand for replenishing electrolytes.
- Dealing with cold weather:
    - Have a rough idea of how cold it will get at night, and then plan for it to get colder than that.
    - Chemical and/or reusable hand warmers can be really nice.
    - Rubber gloves for washing dishes, especially when it's cold out at night and you're using cold water.
    - An extra blanket (even a thin one!) inside your sleeping bag can also help to retain heat.
    - You might be able to build a fire in your camping area for warmth, but first you must check local fire and wood collection restrictions.
    - Filling a water bottle with hot water and putting it in your sleeping bag can help keep you warm on cold nights.

**Camping Tips:**

- If you're bringing a tent you've never used before, you should practice setting it up before you have to do it in the field.
- Pack a sleeping pad and test inflatable ones before you leave to make sure they hold air overnight.
    - These range from yoga mats, to accordion pads, to manually inflating mats, to small air mattresses (with increasing price).
- It can also be a good idea to bring some kind of pillow and anything else you need to be comfortable at night.
    - Getting a good night's sleep is generally going to be more important than trying to minimize the amount of stuff you bring with you.
    - Soft clothes (down jacket, fleece) can be used as a makeshift pillow. Regular pillows can also be vacuum sealed in a ziploc bag to reduce space in your luggage.
- There are different types of sleeping bags with different temperature ratings.
    - The temperature rating is typically the lowest survivable temperature for a sleeping bag and assumes you're wearing the correct clothing inside the sleeping bag, so temperatures above that value may still not be comfortable.
- Baby wipes can be good to bring if you're camping somewhere without showers or running water.

- It is often your responsibility to bring your own medicines or toiletries. If you have questions on what to bring and how to store or dispose of such items, discuss it with your trip leader.

# Suggested Packing List

| General Stuff | |
|---|---|
| Camping/overnight | Daily |
| **Tent (+rain fly, stakes)** | **Day pack** |
| **Sleeping bag (check rating)** | **Water bottle(s)** |
| Sleeping pad | **Sunblock** |
| Pillow | Bugspray |
| Extra blanket(s) | Hand sanitizer |
| Spare batteries | Chapstick |
| Portable phone charger | Lighter |
| Headlamp | Pocket knife |
| Battery-powered lantern(s) | First-aid kit |
| Toilet paper | Radios |
| Shovel | Rain shell |
| | Pack of tissues |
| | Sunglasses |
| | Granola bars |
| | Ibuprofen |
| | Ziploc bags |

| Gear for specific climate/weather | | | |
|---|---|---|---|
| Heat/sun | Snow/ice | Cold | Wind |
| Sun hat | Extra traction (yaktrax) | Hand warmers | Shell |
| UV protection shirt | | Warm hat | |
| Electrolytes (gatorade) | | Gloves | |
| Linen clothes | | Extra jackets | |
| Thermos/insulated water bottle | | | |

| Travel Related | |
|---|---|
| Driving | International Travel |
| Tire plug kit | Passport |
| Fix-a-flat | Adapter |
| Spare tire | |
| Tire chains | |
| Jumper cables | |
| Extra oil | |

## 4. Preparing to do field science

Before heading out on your trip, make sure you figure out your field work goals. This could include knowing what data you need to accomplish your specific research (ie. measurements, observations or samples to collect). Before departing, set aside time to print or download any documents or files that you might need.

**Tips to prepare for field science:**

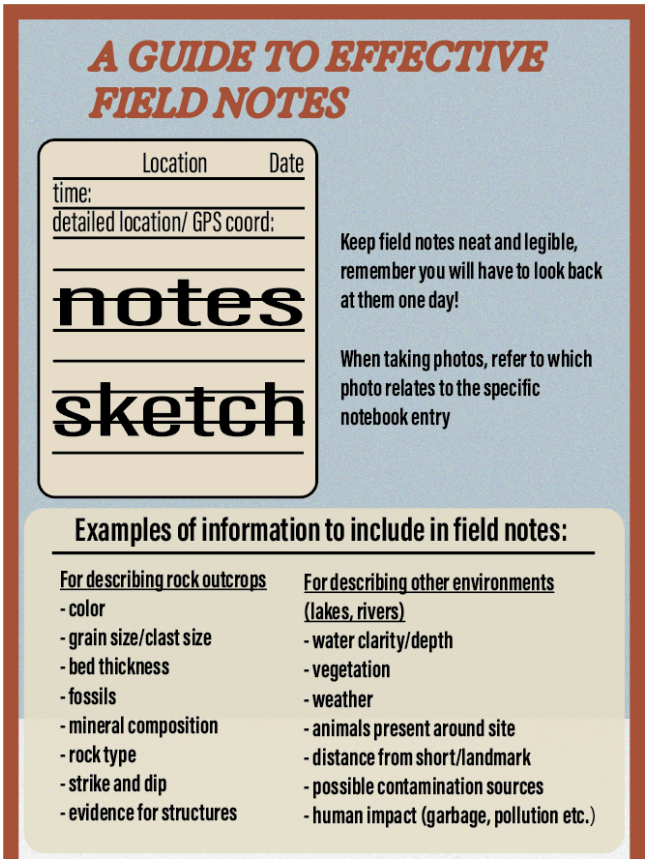
- Identify your research/learning goals (might be done with the help of your PI/instructor/trip leader) and what or who will help you reach them.
- Find the appropriate map (geologic, hydrologic, etc.) of the region you're visiting and identify the sites and locations you know you'll see.
- Find research papers related to the region you are studying and the methods you plan to use.
- Make notes of the key history and geology of the region in your field notebook so that you have that information at the ready.

## 5. How to take field notes

Field notes are a **systematic, detailed record** of observations made during field work. These notes should be accurate, consistent, and reproducible. These notes will vary based on the purpose of field work and the Earth science subdiscipline. Traditionally, field notes have been taken in paper notebooks and include handwritten descriptions and drawings (e.g. *Rite in The Rain* notebooks) but digital notes are becoming more popular for the ability to automatically link gps locations to photos, descriptions, and measurements (e.g. FieldMove, StraboSpot2 etc.)[1]. These notes included both qualitative (colors, textures, relationships) and quantitative (strike/dip, grain size etc.) information. It is important to speak to group leaders before embarking on a field campaign to know exactly what information should be recorded and what tools are needed to make any measurements.

**Field notes should include:**

- Date
- Location (both a general location and individual GPS locations for each entry)
- Scientific observations and measurements
- Sketches




**Example: Describing rock outcrops:**

- Color
- Grain size
- Clast size
- Bed thickness
- Fossils
- Mineral composition
- Rock type
- Strike and dip
- Evidence for structures like faults or folds

**Example: Describing other environments (lakes, rivers):**

- Water clarity
- Vegetation
- Animals you see in and around the site
- If taking samples, you might want to record:
    - Distance from shore/distance from landmark
    - Depth of water
    - First impressions of water/sediment sample
    - Any issues or possible contamination sources
    - Weather conditions
- Record your sense of human presence at the site:
    - Is there garbage? Do people come here for recreation?

## Helpful tips:

- **Be systematic** and use a standard format throughout your field notebook.
- **Record measurements clearly**- Field notes don't have to be pretty or perfect, but they do need to help your future self remember important details about your field sites.
- **Include context**- describe relationships between units, give as much information as possible so you can remember why a certain sample was collected.
- **Sketch and annotate**- field sketches and diagrams can help clarify significance for your future self or help with interpreting field relationships.
- **Document**- If you can bring a phone or camera, taking pictures or narrated videos and referencing them in your notes can be a great way to remember details if you struggle with sketching (don't forget to include a recognizable item in your picture for scale).
- Your note taking style will evolve over time as you learn what information is helpful to you... don't be afraid to see others' notes!
- Always **review** your notes at the end of the day: it will be a lot harder to remember details and observations even by the next morning, especially if you're visiting many sites throughout your trip.
- **Digitize** field notes as soon as you have access to the appropriate equipment while it is still fresh in your mind.

**1. Whitmeyer, S. J., Mogk, D. W., & Pyle, E. J. (2010)**. "Digital field data collection and mapping." *Geological Society of America Special Papers, 461*, 25-41.

## 6. In-field everyday checklists

This section provides some suggestions about common items that can be helpful to have on hand when doing field work on a daily basis. We focus  on individual safety and comfort rather than items that may be necessary to conduct specific types of field work. This list is not intended to be comprehensive or fully personalized; the pamphlet has a section where you can write down any physical or action items that are important for you to remember.

**Pack for the day:**

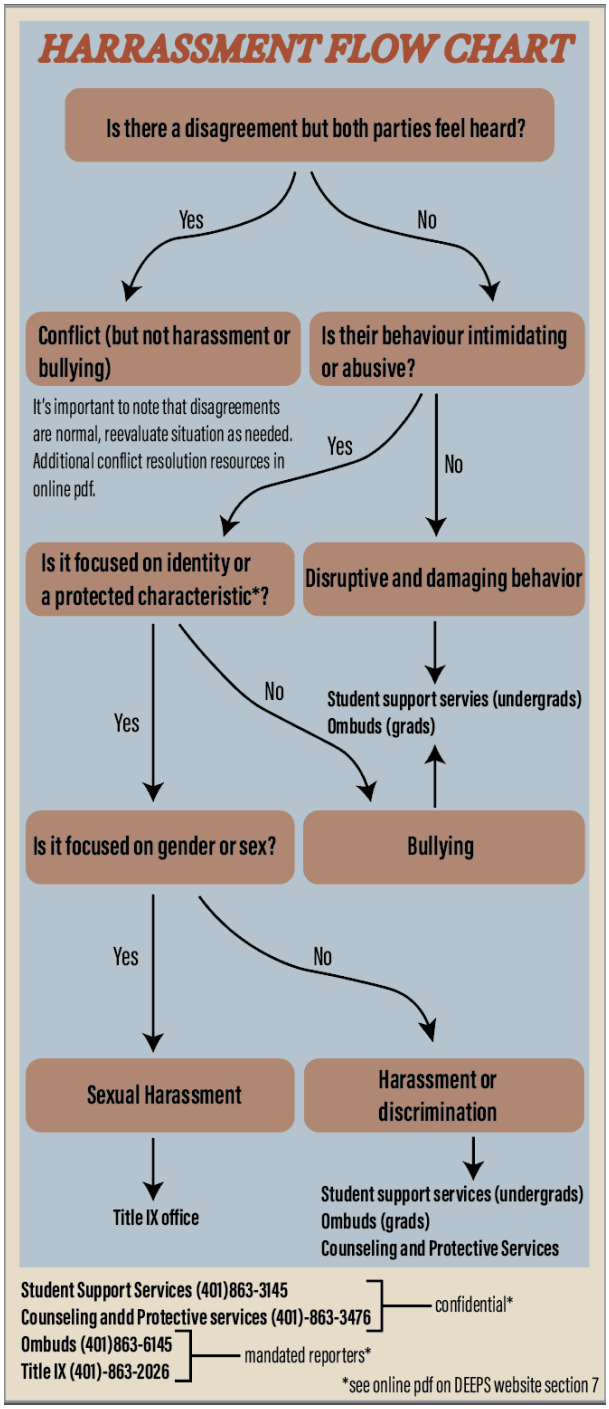
- Sunscreen
- Bug spray
- First aid kit
- Rain shell
- Granola bar/snacks
- Chapstick
- Lighter
- Pocket knife/multitool
- Sunglasses
- Tissues or napkins
- Hand sanitizer

**After returning each day:**

- Review and complete field notes from the day
- Check on itinerary for tomorrow
    - Figure out when you need to be awake
    - Identify research/learning objectives for tomorrow
- Look at weather forecast
- Is there something you need to bring tomorrow that you didn't pack today?

## 7. Identifying and reporting harassment

This flowchart is a guide to identify and differentiate between a personal conflict, harassment, discrimination, and bullying. In the heat of the moment, it can be difficult to identify these, so this guide steers you towards the appropriate resources for your situation. This is applicable not only to your own experiences with conflict, but also conflicts you might witness in your group. This is also located in your printable field brochure.




**Definitions from Flow Chart:**

* A **protected characteristic** according to the U.S. Equal Employment Opportunity Commission includes race, color, religion, sex (including sexual orientation, gender identity, or pregnancy), national origin, older age (beginning at age 40), disability, or genetic information (including family medical history) (https://www.eeoc.gov/harassment).

* A **mandated reporter** is obligated by law to report any incidents of sexual misconduct and relationship violence and constitutes a report and actual knowledge to the University.

* A **confidential resource** has no obligation to report your conversation. These conversations do not qualify as a report to the university.

**Title IX Information and Reporting Harassment:**

- Brown Title IX Website
- Brown Title IX coordinator: titleixoffice@brown.edu; 401-863-2026

- Brown's Online Title IX Reporting Form

**Some Resources for Conflict Resolution:**

- https://blog.hubspot.com/service/conflict-resolution-skills
- https://www.wellable.co/blog/conflict-resolution-techniques-in-the-workplace/

## 8. Ethics and field work

When conducting field work, you are often entering a place and community that is not your own. In order to participate in and conduct meaningful and ethical field work, it is important to prepare and educate yourself about the land, the people, and the culture that ties them together. Even when traveling domestically (but especially when traveling internationally), it is the responsibility of any researcher, student or otherwise, to do their due diligence by researching the region before traveling and consistently leading with respect while on your trip.

Before you travel, a few important things to research include the regional language, the historical and current impact of colonization, and environmental protections and concerns in the areas where you will be doing your work. In many places, culture, religion, science, history, and the environment may all intersect in ways that you are not accustomed to. It is also important to recognize that in many places around the world geosciences have been and continue to be extractive and exploitive [1,2]. Investigate the history of mining and geosciences in the area, and do your best to contextualize the intentions of your trip in that history. This could take the form of reaching out to regional community leaders, or learning phrases that clarify your intentions in the local language. While your research may contribute to the narrative of a region, keeping its larger story (past and present) in mind as you do your work is ethically vital and may help you discover new interesting questions.

Part of being a respectful visitor requires that you listen to concerns, questions, and suggestions of locals[3]. You may be interested in a site due to a unique geological feature, but locals who use that feature as a landmark, watersource, ceremonial site, etc. might be concerned about what kind of impact your work will have on their home[4]. The response of a local community and environment will be different in every place. Be prepared for changes to your itinerary or plans, and remain mindful of your presence as a guest and outsider.

**1. Rogers, S. L., Lau, L., Dowey, N., Sheikh, H., & Williams, R. (2022).** Geology uprooted! Decolonising the curriculum for geologists. *Geoscience Communication*, *5*(3), 189–204.
**2. Pico, T. (n.d.). The Darker Side of John Wesley Powell.** Scientific American. Retrieved February 12, 2025, from https://www.scientificamerican.com/blog/voices/the-darker-side-of-john-wesley-powell/
**3. Ramírez-Castañeda, V., Westeen, E. P., … Tarvin, R. D. (2022).** A set of principles and practical suggestions for equitable fieldwork in biology. Proceedings of the National Academy of Sciences of the United States of America, 119(34).
**4. McDonald, M. N., Jenn. (2021, September 7).** *Recognizing Geology's Colonial History for Better Policy Today*. Eos.

9. Field safety and links to other resources

**Example Field Safety Guides**

- University of Pittsburgh Field Safety Manual: https://www.ple.pitt.edu/sites/default/files/Documents/pitt_biological_sciences_field_safety_manual_6-5-2023.pdf
    - A guide for developing a field research safety manual that explicitly considers risks for marginalized identities in the Sciences (Rudzki et al. 2022)
- Kent State University Manual of Field Safety: https://www-s3-live.kent.edu/s3fs-root/s3fs-public/file/Manual%20of%20Field%20Safety_0.pdf?VersionId=KT89et0zSTarXaLRvhBXlOR6rYcg8R5g
  Yale University Field Safety Handbook: https://ehs.yale.edu/sites/default/files/files/field-safety-handbook.pdf
- Field safety! an e-zine by and for trans and queer scientists: https://ezrakottler.wixsite.com/field/field-safety-e-zine

**Bathroom Tips and Best Practices**

- https://www.rei.com/learn/expert-advice/hygiene-sanitation.html
- https://osf.io/preprints/osf/gnhj2

**Menstruation in the Field**

- https://www.antarcticglaciers.org/2022/09/menstruation-in-the-field/
- https://docs.google.com/document/d/1MLwvxzA3KW_885NV8qNQYLbsk7QSPnCCsJGte8sz8Ns/edit?usp=sharing

**Example Packing Lists (both from field camps)**

- https://www.montana.edu/earthsciences/fieldcampprograms/documents/fieldequip.pdf
- https://www.sjsu.edu/geology/docs/field_camp/equipment_list2018.pdf

**Basic First Aid**

- https://www.redcross.org/take-a-class/first-aid/performing-first-aid/first-aid-steps

**Additional Resources (for leading fieldwork)**

- https://serc.carleton.edu/advancegeo/resources/field_work.html
- https://eartharxiv.org/repository/view/2607/

## 10. Emergency information and contacts

This section is intended to be filled prior to field work and can be printed and kept in the field vehicle or folded up and brought in your backpack.

- Local emergency contacts:
    - Police: _____
    - Fire: _____
    - Emergency rescue: _____
- Nearest hospital:
    - Contact: _____
    - Location: _____
- Local field contact: _____
- Allergies in group:
    - Name and allergy: _____
    - Location of medication: _____
    - Name and allergy: _____
    - Location of medication: _____
    - Name and allergy: _____
    - Location of medication: _____
- Local language:
    - Hello; goodbye: _____
    - My name is... : _____
    - I am a geologist/researcher: _____

      _____
    - I need help: _____
    - Names of common medications: _____

      _____
- Contact for international SOS/consulate: _____

  _____

- Emergency contacts of group members:
    - Name of group member: _____
    - Emergency contact: _____
    - Name of group member: _____
    - Emergency contact: _____
    - Name of group member: _____
    - Emergency contact: _____