

Achieving scientific projects in Central Africa: some shared experience.

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Introduction:

Successful field deployment or mission relies on good preparation. Good preparation requires to foresee as much eventualities as possible and to be ready for them.

The poster intends to present some of the basic -though criticalconsiderations when deploying research activities in the very spe- Unanticipated cific context of Central Africa. That shared experience relies on more than 7 years of research achieved in Eastern Democratic Re-



public of Congo and more than 20 years of experience in other region of Africa and Southern America. It does not intend to be exhaustive. Rather it is a list of encountered situations that were sometimes not anticipated while preparing proposals. Each separately is probably obvious, but by sharing our check list, we hope it can help other scientific teams in their preparation for fieldwork or field deployment. We do not consider here the basic precautions to take when traveling in equatorial regions such as vaccines, insurances etc... The situations mentioned here are of course not restricted to Africa, but our experience showed us that the chances to encounter (and combine) them are probably higher in some parts of that wonderful continent.

And because some problems do not happen only to others...

Planning field work:

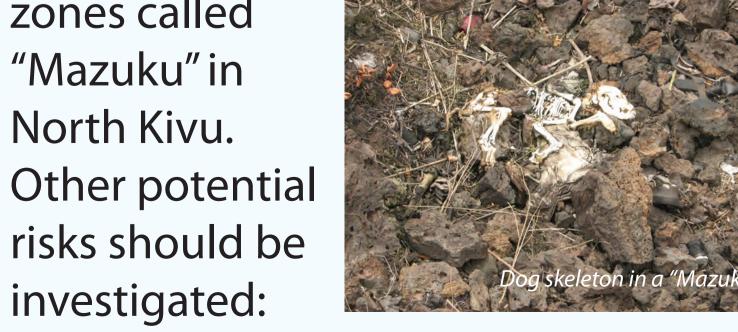


- ✓ Gather topographic/geological maps if they exist (often small scale, outdated, difficult to access).
- Assess the accessibility of targeted spots bearing logistics and security situation in mind. Some areas may require an armed escort and extra costs.
- For instrumentation sites, identify apparent good places where to install the instruments regarding the expected signals. Consider the guarding cost.



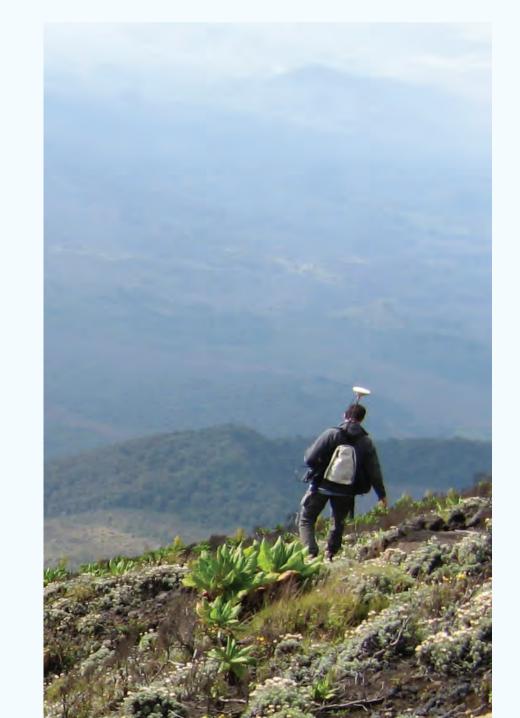
Ensure that the selected **place** is accessible and safe. The place illustrated on the picture looks nice but the sign warns that lethal CO2 concentration may be encountered. There is not always a warning sign, nor a dog skeleton to warn of these danger

zones called "Mazuku" in North Kivu. Other potential risks should be



flooding, mud flows, rock falls, presence of wild animals...

Take the time to talk with locals, they will learn and help you (in general) a lot!



Be well prepared and equipped and go with local partners for prospection in the **field**. Regarding the needs, bring water, food, geological hammer, GPS, compass, binoculars, camera, maps etc... Foreigners wandering in the wild or in villages with equipment always raise questions or even suspicion. Informing local population is nice to them and avoids creating concern.

Ship the material and instruments. In addition to the shipping cost, taxes may apply. Depending on the country and duration of importation, taxes may reach up to 100% of the instruments' value.



Think long term: if the place looks good today, will it be ok later? Changes can be from a natural origin (like the lava flow that crossed the city of Goma here above) or from anthropogenic origin. The three pictures below show a seismic station in North Kivu that used to be a quite place, but that was successively used by soldiers, then surrounded by a refugee



Don't be tempting... The weather station overhanging a 150m vertical cliff was thought to be out of reach. Yes. Nevertheless armed men used it as target for fire practice. A simple geodetic benchmark can be interpreted as a marker for burried ressources (e.g. gold). It will be removed and the place excavated.

Identify local and international partners.

Planning the collaboration:

- Elaborate proposal with local partner(s) (avoid misfit with local expectations). Priorities of local partners may differs from ours.
- Do not neglect differences in cultural habits.
- ✓ Human relationships are sometimes the most delicate point (either existing prior our arrival or created by our arrival).
- Check if research permit is required.
- Check if joint PhD (international vs local) is required.
- Local training and capacity building: dedicate enough time to involve local partners in the sites selection, instruments installations, maintenance, data processing and results interpretation.

Installation:



Inform and negotiate with local population. Do not neglect the importance of local authorities such as the customary chief or village chief. Involving the local population generally improves the security of the equipement.

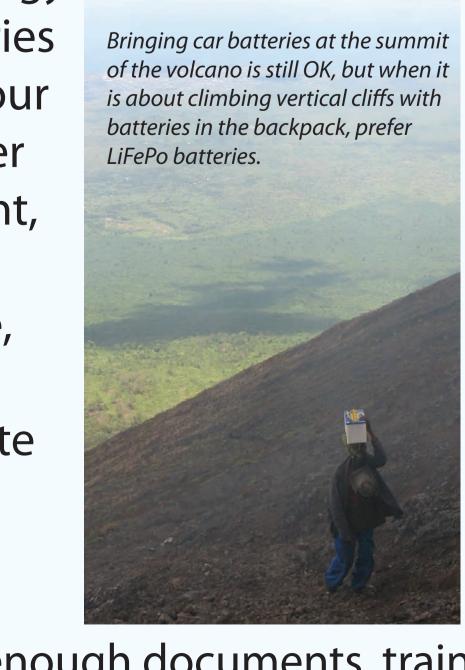
Deal with local infrastructures:

The power supply, if it exists, may not be reliable or fit the usual standard. Stabilizer, lightning protection, UPS are usually highly recommended.



If no power is available, solar panels will be needed. For field measurements, batteries are needed: define the technology

of the batteries regarding your needs (power versus weight, operating temperature, charge and discharge rate



Leave enough documents, training manuals, wiring maps etc... Take a lot of pictures and notes: it may help later to remotely give instructions for repairing or upgrading equipment.

Build the monument or the shelter if re-

Ensure **proper ground coupling**. Local conditions may require using various techniques depending on the ground texture, available resources, cost for bringing specific tools or materials...:

bars sealed in the bedrock with low shrinkage resins,



or building a complete station with a geodetic pillar anchored in the bedrock without contact with the building...

Hire sentinels and agree on the salary and payment interval and conditions (e.g. when data are ok).

Data transfer to international institute: deal with the local Internet infrastructure (often slow and affected by interruptions). Set up the transfer procedure accordingly e.g. for sending small size files and with recurrent check. If the amount of data overrides the capabilities of the transfer, consider sending subsampled data for monitoring and collect full sampled data during onsite visits.

If data transmission is needed, consider satellite, phone or radio link for long distances and cable or Wi-Fi for short distances. Think that telephone networks are highly solicited or even saturated in crisis situation (e.g. volcano eruption). Keep in mind that ambient noise may increase and degrade transmission quality e.g with the development of cellular networks that may broadcast there with higher power. Sometimes also the radio frequency band may suddenly be restricted for military use. Adapt the fre-

quency band to the quality of the line of

sight and do not forget that vegetation

grows quickly in equatorial regions.

Choose between on-site data

storage or data transmission up to

local place. Sparse maintenance, (i.e.

long duration storage) increases the risk

nance, chances for him to remember the

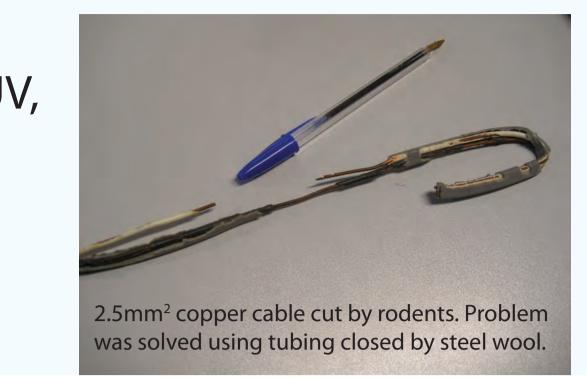
procedure are higher if he must apply

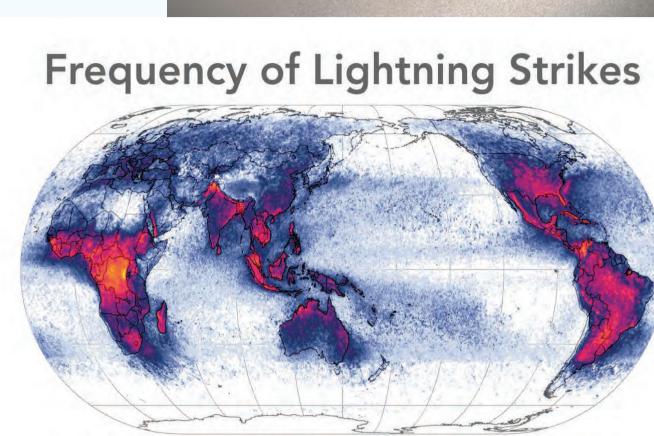
them regularly and at short intervals.

Never underestimate the unexpected:

- ✓ Rodents like very much plastic and copper cables...
- Lightning strikes may be more common and violent in some parts of the world. Be prepared and consider enough spare parts.
- ✓ Theft might be common during peacetime and lootings are favored during period of instability.
- Do not neglect destruction by gases, acid rain, water, humidity, UV, dust, heat...
- ✓ If you plan to bring back rock samples, ask local partners for appropriate certificates.
- ▼ Cables were sometimes (accidentally?) unplugged. Fix cables and loose equipment with tape or tie wraps.

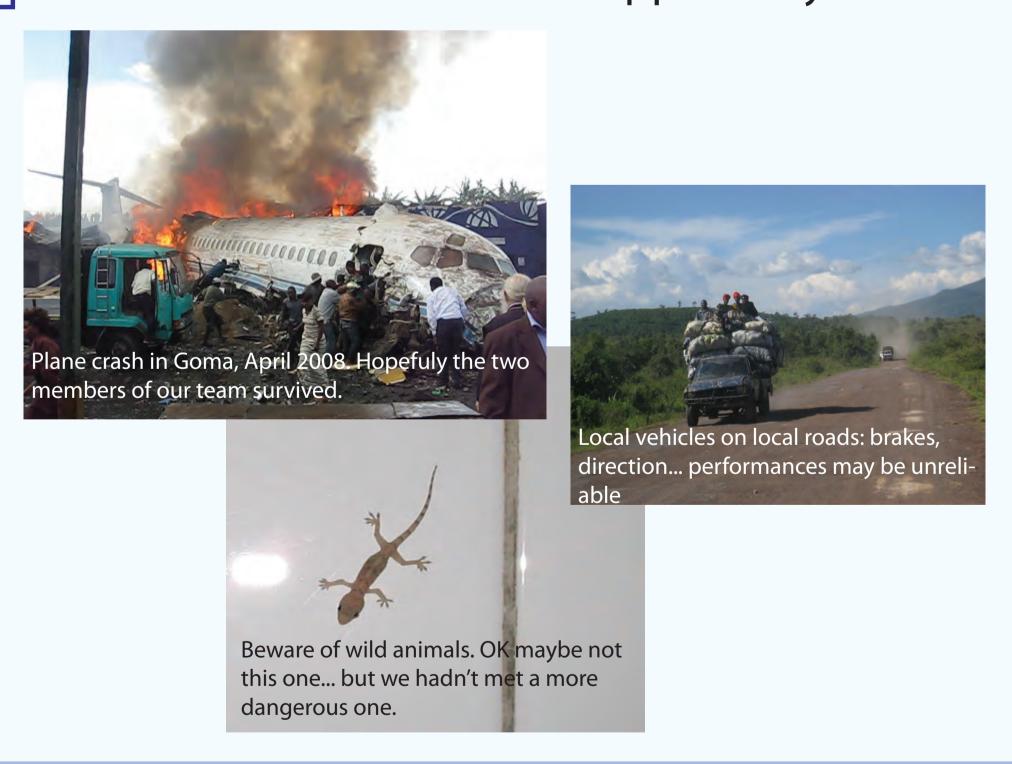
Illation of a metallic corner reflector (CR) inside the Nyiragon





Think about your own safety:

- Listen to local colleagues advises.
- ✓ Do not drive (or walk) after dark where not appropriate.
- Beware of local transports (roads, planes etc...) you should board in or that you could cross.
- ✓ Watch food and drinks.
- ✓ Beware of wild animals or insects.
- Keep in mind that some hazardous and/or remote areas may be inaccessible for rescue.
- Climbing: volcanoes are not like solid cliffs. Specific material and trainings may be advisable.
- Remember that it does not happen only to the others...



Conclusions:

Even well aware of all this, be prepared to be surprised by more unexpected events. Just one more example? The SIM card from a data transfer system based on cellular phone connection was "borrowed". The modem was however safely locked in a restricted room in an observatory. In addition to the inconvenient of a 3 months long data gap, we had to pay a 3300 USD bill as the SIM card was used in the meantime as a public phone. We should have thought about asking the phone company to set a usage limit. The system used to cost only 19 USD per months...

Fieldwork must remain efficient. Sometimes difficulties make it not as rewarding as expected. Preparing carefully and foreseeing as much situations as possible may make the difference.

When no static IP address is allowed, Dynamic DNS does not work and VNC or VPN are not permitted (a situation we face in DRC), think about controlling remotely a computer with e-mail. If subject and body contain the correct keys, it will execute a set of predetermined operations or execute the command lines that are written in the message.