



50 million Scouts making the world's largest youth contribution to the Sustainable Development Goals

national challenge 2022

Scouts

SCOUTS GO SOLAR

"The smartest energy choice under the sun"

QuotesGram



All over the world, there is an urgent need to address the Sustainable Development Goals, to mitigate Climate Change, and in particular to reduce CO2 emissions. In order to achieve a better and more sustainable future for all, we all have a role to play. As Scouts, it is our duty to get involved and to make a difference. This year as our SDG National Challenge SCOUTS South Africa is "Going Solar". As a Leader, you can set a good example and create more awareness about solar energy, by motivating your Scouts to complete the national challenge.

The Challenge:

The Going Solar Challenge has three sections with two subdivisions in each. There is a general educational set of requirements, and then a project-based requirement per section, similar to how many Interest badges are structured. Each Scout must complete x number of general education requirements within each section, and then one or two practical requirements. Activities, particularly the projects, can and should be done as a Patrol whenever possible.

Section 1: Sun is life

Requirements:

Do any **THREE** of the following:

1. Build a small display showcasing 5 different types of leaves. Label each species, its habitat, and write a brief note explaining why each leaf is uniquely different.
2. Use a prism to separate the different colours in sunlight. Compare the spectrum of sunlight to other sources, such as fluorescent lightbulbs.
3. Build a simple sundial. Use it to accurately tell the time of day at two different times spaced at least 6 hours apart.
4. Find an approximate north bearing by using:
 - a. Only a wristwatch.
 - AND**
 - b. Only a stick and what can be drawn in the sand.
5. Use a plastic bag to condense fresh water either from: ¹
 - a. evaporation from a plant's leaves
 - OR**
 - b. seawater

¹ See: Survival Interest Badge

Repeat this with both an opaque and a transparent plastic bag. Measure how much water you condensed over the same amount of time and explain why one bag was better than the other.

6. Build a simple model to explain to your Patrol why the tropics are hot, the poles are cold, and why the Earth has seasons.

OR

With your Patrol, build a scale model of the solar system up until Mars, with a true proportion between the size of the Sun, the planets, and their orbital distance.²

Do **ONE** of the following:

1. Plant two individual or similar groups of seedlings, of the same species, but plant one in a shaded area and the other in an open area. Care for your plants for at least three weeks. Over this time, regularly photograph your plants, showing their growth. After three weeks (or longer), compare how your plants have grown and explain how the difference in sunlight (or other factors) might have affected your plants' growth and why.³
2. Give a practical demonstration to your Patrol explaining (scientifically) one of the following topics:
 - a. Why the sky is blue and what a sunset really is.
 - b. Why most things have colour and why some objects are transparent.
 - c. Why dark coloured objects are hotter when under the sun.
3. With the help of an experienced astronomer with the necessary equipment, photograph the sun. Learn about the features in your photograph by either researching them or by discussing the photograph with the astronomer. Share your photograph and what you've learnt with your Patrol.

Warning: **NEVER** look directly at the sun without the specialised equipment intended for this task.

4. Using a suitable microscope, either photograph or draw a sketch of a plant leaf cell. Use this to explain to your Patrol how the plant photosynthesizes by showing features in the cell unique to plants. Also, name and explain the role of the chemical that makes most plants green.

² See: Astronomer Interest Badge

³ See: Farmer Interest Badge, Food for Life

Section 2: Impacts of the sun on health and the environment

Requirements:

Do any **FOUR** of the following:

1. For a possible camp — using information from a map, pictures, and your familiarity with the area — pinpoint at least three locations for your campsite. Of these locations, predict and order these sites from hottest to coldest. Then, either explain how you determined this, or go to these places and measure the temperature.
2. Build a model to demonstrate the Greenhouse Effect by using a space blanket or similar object to represent how CO₂ reflects energy back upon the Earth. Use a thermometer to show how the surface temperature increases when the space blanket is appropriately placed to reflect terrestrial radiation.

3. Either:

Participate in an emergency scenario involving the treatment of any of the following:⁴

- a. Sunburn
- b. Sunstroke
- c. Dehydration
- d. Heat Exhaustion

OR

Train your Patrol and organise the above scenario yourself.

4. While on camp, build a passive fridge to help keep food cool. Your fridge should do all of the following:⁵
 - a. Shade the food from direct sunlight.
 - b. Insulate your food from the hot ground surface.
 - c. Use water for evaporative cooling.
5. Build your own pair of sunglasses. Wear them for a day while Scouting or post a picture of you wearing them on social media tagging @SAScout.
6. During a day out Scouting, apply a SPF-30 rated sunscreen on one arm, and SPF-50 on the other. At the end of the day (or sooner if you start to get burnt) determine which sunscreen is more powerful. Explain why you think some sunscreens are more or less effective than others.

⁴ See: First Aid Interest Badge

⁵ See Camping Scoutcraft Badge, Camp Quartermaster Interest Badge

7. Either:

Explain why being in the sun can lead to a suntan and how this is different from getting a sunburn. Also, explain what Melanin is and why populations from different locations have different skin colours.

OR

Chair a discussion with your Patrol covering the same topics as above.

8. Explain what the term "carcinogenic" means. Explain what UV-B radiation does to DNA.

AND

Explain what the Ozone layer is.

Do **ONE** of the following:

1. Using polarisation lenses, give a demonstration on how light reflected from the ground or water is polarised and how polarised sunglasses work differently to non-polarised sunglasses.

Bonus: Use three sets of polarisation lenses to demonstrate the Heisenberg Uncertainty Principle.

2. Through a practical demonstration using sand and sieves, illustrate the differences in transmission of UV-A, UV-B and UV-C radiation through the atmosphere, what each sieve represents, and state approximately how much of each type makes it to the surface of the Earth.

3. Build a greenhouse and use it to cultivate a crop. Also, grow another of the same type of crop in a small area outside of the greenhouse. Once harvested, show how the greenhouse improved your yield compared to the crop grown outside.⁶

4. Participate in or organise your own local fundraising or public awareness event to support victims of cancer. Fundraising events must consider the provisions contained in the Finance, Fundraising and Administration Policy. The event should require at least one day's effort on the ground and should involve cancer patients, if possible.⁷

5. Modify your home to improve the temperature inside. For example, add insulation to the roof, repaint walls, or grow plants nearby. Either give your Scouter a tour of your work or take clear photographs to show what you have done. Air conditioners and fans do not count.

6. NASA recently launched the James Webb Space Telescope. The space telescope uses a large sunshield to remain cool from the sun. Using the space telescope

⁶ See: Farmer Interest Badge, Food for Life

⁷ This can also be a community service project.

as inspiration, build a shelter that uses multiple overlaying sheets or canvasses to remain very cool underneath.⁸

7. Organise a clean-up campaign to collect at least 100kg of glass waste from natural areas and deliver this waste to a recycling facility.⁹

Section 3: Use of solar energy

Requirements:

Do any **THREE** of the following:

1. Build various aids, illustrations or models to explain the following:
 - a. What are stars and what is nuclear fusion?
 - b. What is a photon and how does light carry energy?
 - c. Why do some objects reflect light and others do not?
 - d. How does a lens work?
 - e. What is the photoelectric effect and how does a photovoltaic cell work?
2. Use a magnifying glass to light a fire. Aside from the magnifying glass, you may only use natural materials, such as grass and wood.¹⁰

AND

Show how a glass bottle also lenses light. Explain why glass waste is considered a fire hazard.

3. Estimate your daily household energy consumption either by tallying how much power each major appliance uses, or by checking your municipal bill. Then estimate the mean solar irradiance for your geographic area. Use this information to determine:
 - a. How much ground area would you require for enough solar panels to match your average household energy consumption? Assume the sun shines for 12h per day and neglect all inefficiencies.
 - b. How much battery capacity would you require to last you through the night?
 - c. Find a typical solar panel and battery available for sale. From your above calculations, how much would it cost in solar panels and batteries to meet your household's energy demands?
 - d. Assuming you could completely disconnect from Eskom, approximately how long would it take to break even on your solar system?
4. By researching online, and through discussions with your parents, peers, teachers, and experts, produce a map of the existing major renewable energy sources in Africa, including wind, solar, hydroelectric, geothermal, and any

⁸ See: Camping Scoutcraft Badge, Camp Quartermaster Interest Badge

⁹ This can also be a community service project.

¹⁰ See: Survival Scoutcraft Badge

other renewable types. Use your map to explain to your Patrol how South Africa compares in terms of its renewable power generation to the rest of the continent.

5. Install a mirror-based device to illuminate a part of your Scout hall, Patrol corner, or room in your home that is otherwise dark during the day.

OR

Install a solar-powered light to illuminate your Patrol corner, an area around your Scout hall, or another useful area that your Troop uses regularly. (The system can be mobile for security purposes).

Do **ONE** of the following:

1. Build a portable solar charger capable of charging a mobile phone via a USB cable. The device should be made from raw components and cannot simply be bought as a kit. Draw the device's schematic and explain how it works. Demonstrate that it works by charging a phone by at least 20%.¹¹
2. Build a reflective solar cooker and use it to cook an egg. Eat the egg.
3. With the assistance of a professional engineer, install an off-grid solar or hybrid energy system for a small household or larger. The system should include solar panels, a battery storage system, and a power inverter. Assist with testing the system to ensure that it works as intended.¹²

OR

For 2 months, maintain an existing off-grid energy system. Conduct regular maintenance tests and demonstrate the following:

- a. How to detect and replace a defective solar panel and battery.
 - b. How to measure the health of a certain type of battery (lead-acid, lithium ferrophosphate or gel).
 - c. How to safely turn the system on and off.
4. Build a solar power system to power a small electric mechanism of your choice. For example, power a mechanism that will open and close windows of a greenhouse automatically. The design does not need to be unique and may reference another existing design from a similar system, or use general purpose electronic systems for such purposes, but should not be an all-in-one device or come as a kit.¹³
 5. Build a solar geyser and use it to heat at least 20L of water to 40°C.

¹¹ See: Electronic Engineer Interest Badge

¹² Can be linked to Electrician Interest Badge

¹³ See: Electronic Engineer Interest Badge

6. Organise a tour to a renewable energy plant for your Patrol. This can be any renewable energy source, not just solar. Arrange for one of the engineers to be your guide and to explain the system.

Useful Resources

1. [WOSM Scouts Go Solar Resources](#)
Homepage:
<https://www.scout.org/scoutsgosolar>
Workbook:
https://www.scout.org/sites/default/files/library_files/Solar_Workbook_2015-1.pdf
2. [Smart Greenhouse Project](#)
<https://hackaday.com/2017/08/26/raspberry-pi-is-the-brains-behind-automated-greenhouse/>
3. United States EPA Scientific Resources
Ultraviolet Light:
<https://www.epa.gov/sites/default/files/documents/uvradiation.pdf>
Ozone Layer:
<https://www.epa.gov/ozone-layer-protection/basic-ozone-layer-science>
4. [James Webb Space Telescope](#)
<https://www.jwst.nasa.gov>

Reminders:

- **National Scout Challenge deadline: 30 November 2022.**
All entries are to be submitted to your Regional Team Coordinator by 11 December 2022.
- On completion of the national challenge, the Scouts and Scouters who took part will be awarded a special national challenge badge and the Troop will be awarded a special challenge certificate.
- **You can also get your Messengers of Peace badge**
Please [upload your community service projects](#) (20 hours or more) to the Messengers of Peace / Scouts for SDGs website. Go to <https://sdgs.scout.org/>; create an account or log in; click on "take action" and add your content as a community service project.

Once completed, email the link to info@scouts.org.za with the subject line Messengers of Peace. You will receive an acknowledgment and can then purchase your MOP badge from the National Scout Shop (shop@scouts.org.za).