



CRITICAL THINKING ACTIVITY: UNDERSTANDING THE EARTH SYSTEM

Apollo 17 astronauts captured this snapshot of the Earth system on their way to the moon in 1972. Essentially everything that was a part of the **system** then is still a part of the system today—that's why it's considered a **closed system**. All of the matter (solid, liquid, and gas) and all of the processes that move energy and materials from one part of the planet to another make up the *Earth system*, and are never replaced.



Four major parts of Earthwork together as a complex system: rocks, water, air, and life. On a global scale, each part can be thought of as a **sphere or subsystem**, roughly the same size and shape as the planet. The four parts are called the **lithosphere (rock)**, **hydrosphere (water)**, **atmosphere (air)**, and **biosphere (living things)**.

The surface of the lithosphere, where the rocky part of our planet is in contact with water, air, and/or life is generally where the spheres intersect and affect each other. The processes that move matter and energy from one sphere to another are called **sphere interactions**.

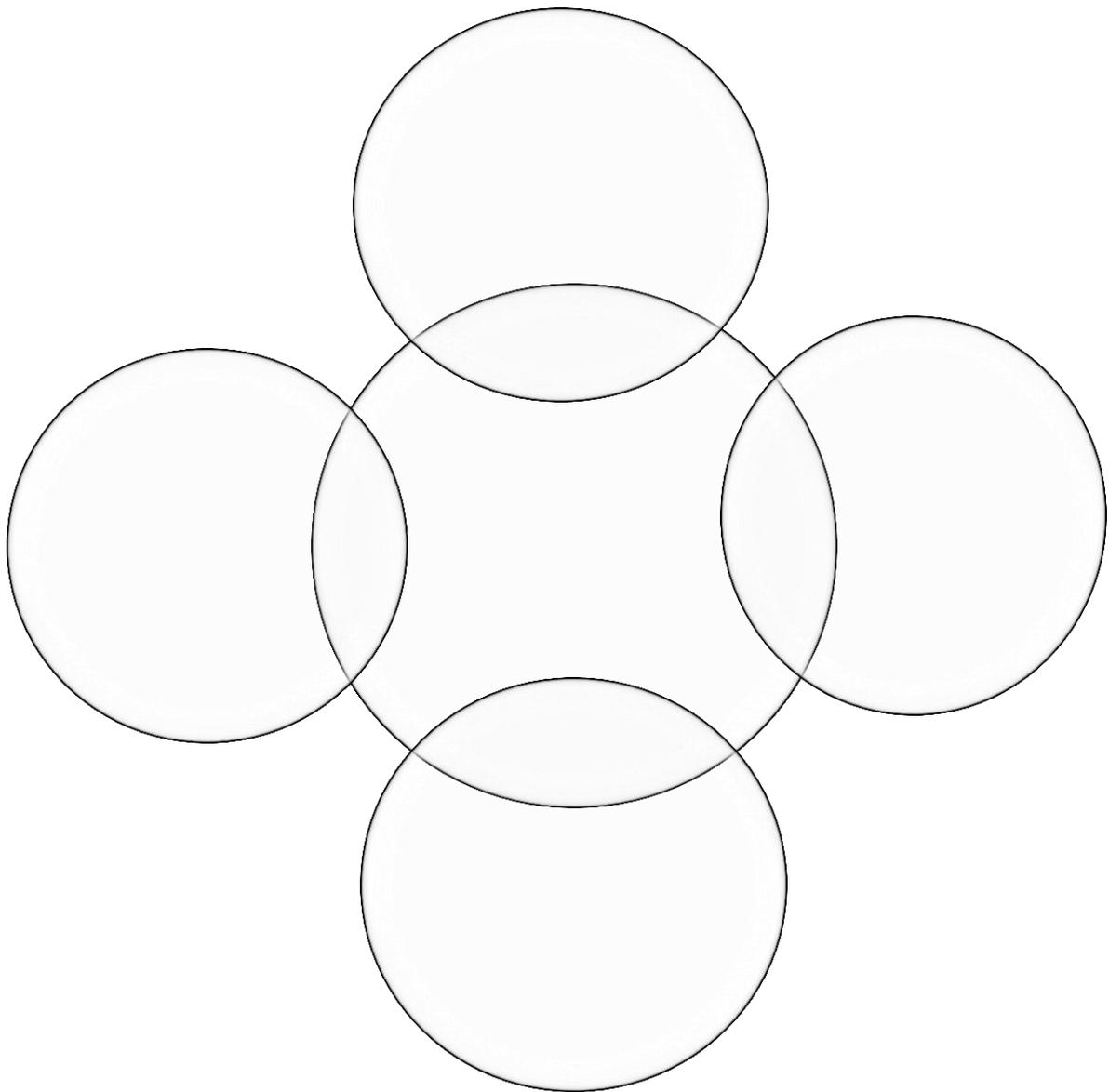
The current "balance" among these interactions makes it possible for life to be successful here. Because the spheres are all part of the same interconnected system, changes in any one sphere eventually affect the other spheres as well.

Humans are just one element of the biosphere, but we affect the Earth system in unique ways. Over 7.5 billion human beings live on our planet and each one affects the system at some level. Your own daily interactions with the other spheres may seem small, but when they are multiplied by 7.5 billion, the effects become obvious. Some human activities, like the burning of fossil fuels, are affecting the Earth system on a global scale.

Student Sheet 2

PART A: IDENTIFY THE MAJOR SPHERES- Identify the major spheres of our planet that can interact as a system by completing the graphic organizer below.

1. Label the circle that represents the Earth.
2. Label each circle with the correct subsystem (sphere) name.
3. Draw and color a visual representation of the subsystem in each circle.



PART C: IDENTIFYING INTERACTIONS

1. What sphere interactions can you assume from this photograph? To identify sphere interactions, think of one feature in the image at a time, decide which sphere it is a part of, and then consider how it interacts with the other spheres.

2. With a partner, practice describing the interactions in this scene,



tracing the movement of materials or energy through all four of Earth's spheres if possible. Write out as many of these interactions as you can.

PART D: IDENTIFYING INTERACTIONS BETWEEN SPHERES

1. LITHOSPHERE/BIOSPHERE INTERACTIONS

Describe interactions between the lithosphere and the biosphere for each



image.

2. HYDROSPHERE/LITHOSPHERE INTERACTIONS



Describe the interactions between the hydrosphere and the lithosphere illustrated by these images.

3. ATMOSPHERE/BIOSPHERE INTERACTIONS



Describe interactions between the atmosphere and the biosphere for each image.

4. HYDROSPHERE/ATMOSPHERE INTERACTIONS



Describe interactions between the atmosphere and the hydrosphere for each image.

Student Sheet 6

5. ATMOSPHERE/LITHOSPHERE INTERACTIONS



Describe interactions between the atmosphere and the lithosphere for each image.

6. HYDROSPHERE/BIOSPHERE INTERACTIONS



Describe interactions between the hydrosphere and the biosphere for each image.

PART D: ANALYZING INTERACTIONS

In each image, look for evidence of materials and energy moving among the spheres and record your information on the chart that follows:

- ✚ List the major features in the image. Tell which sphere(s) it represents.
- ✚ Describe sphere interactions you can infer from the scene.
- ✚ Where possible, follow the results of an interaction thru all 4 spheres.

1.



Vanuatu Island, Pacific Ocean

2.



Forest fires, Colorado, USA

Student Sheet 8

3.



Oil wells burning, Kuwait and the Persian Gulf

4.



Deforestation in South America

Student Sheet 9

5.



Volcanic eruption on a Pacific island

6.



Strip mining for gold in the African rainforest

DATA TABLE: SPHERE INTERACTIONS

IMAGE LOCATION	OBSERVATIONS	HYDRO	LITHO	ATMOS	BIOS
