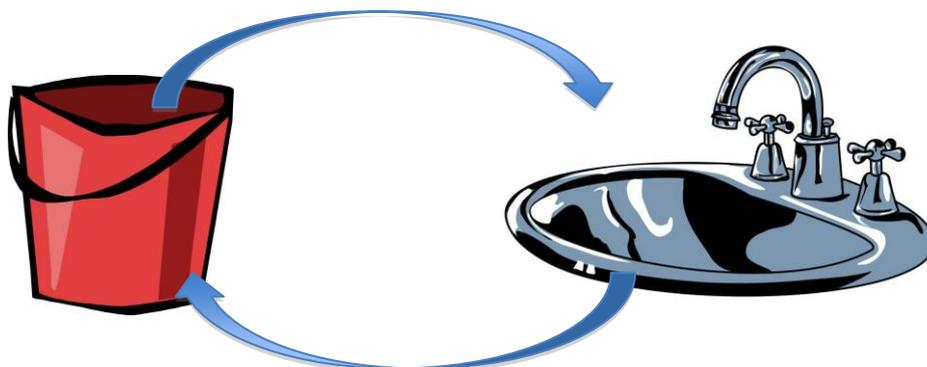


Source to Sink – Student Activity



Since our planet formed from a cloud of stellar dust about 4.5 billion years ago, little matter has been added or lost. Most of the original atoms are still here, however they have travelled around a bit! In Year 9 Earth Science we learned how heat and gravity have moved materials within the planet to form the core, mantle, crust and atmosphere. Although movement still occurs within the planet, it is on a geologically slow scale.

At the surface of Earth materials move from one location to another at a much faster rate. These locations can be described as four intersecting spheres or zones:

- A **biosphere** where life occurs
- A **hydrosphere** where water is found
- A **lithosphere** of rocks and soils at the surface of the planet
- An **atmosphere** of gasses surrounding the planet

Materials can move within spheres and between spheres.

Materials per student

- A pair of compasses or a circular object such as the base of a beaker.
- A pencil

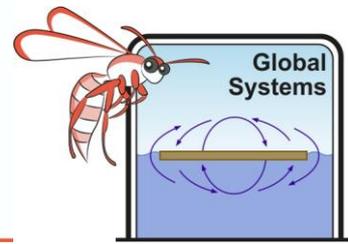
Draw a concept diagram of the four intersecting “spheres” and label each sphere.

In reality, do these spheres look like this? Explain your answer _____

Why do you think scientists use the word “sphere”? _____

In which sphere do living things exist? _____

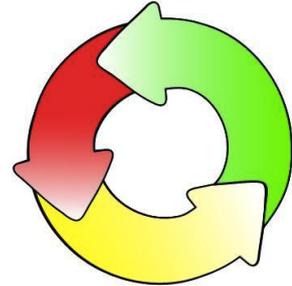
Source to Sink – Student Activity



When discussing matter moving from place to place in global systems, we use the terms:

- Source** The original location of the material.
- Reservoir or sink** The location to which the material is transferred and stored for an indefinite period of time.
- Releasing agent** The process or activity which releases the material from the sink.
- Forcing factor** The process that causes materials to be released at a faster rate.
- Cycle** Balanced movement from sources to sinks. Over geological time inputs should equal outputs.

Of course during any cycle a sink in time will become a source when the material moves on to another sink. There must always be an overall balance between the rate of output from the source and the rate of input to the sink.



Example: Carbon dioxide

1. A jarrah tree takes in carbon dioxide from the atmosphere during photosynthesis. It can live for 140 years. When it dies and decomposes it releases carbon dioxide back into the atmosphere over 140 years. Name the sources, releasing agents and sinks.

Sources _____

Releasing agents _____

Sinks _____

Time taken _____



Is this a balanced cycle of inputs and outputs? _____

Name the sources, releasing agents and sinks for carbon dioxide involved if humans burn down 40 year old jarrah trees to clear land for building houses.

Sources _____

Releasing agents _____

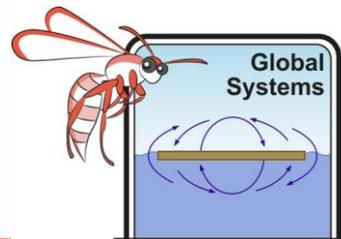
Sinks _____

Forcing factor _____

Time taken _____



Is this a balanced cycle of inputs and outputs? Explain your answer _____



Source to Sink – Student Activity



Imbalance can be the result of natural occurrences. Iceland is an island in the middle of the North Atlantic Ocean. It lies over a mid-oceanic ridge. Massive volcanic eruptions from fissures on the sides of “Laki” volcano between June 1783 and February 1784 poured out 14km³ of lava and released poisonous gasses, sulphur dioxide, fluoride and carbon dioxide that instantly killed a quarter of the island’s human population and most of the agricultural plants and animals. Many more died of starvation in the following months.

The effects of the “Laki fires” were felt all over Western Europe and even in North America. Dust obscured sunlight and there was a longer colder winter in the following year. The Mississippi river froze, there were terrible floods and crops died and rotted in the fields. Increased CO₂ in the atmosphere caused two years of increased temperatures and drought. Fluorine from volcanic ash contaminated crops. People starved and the old and young died in increased numbers. It has even been suggested that this helped trigger the French Revolution. Dust from this eruption is even reported to have affected the monsoons in Burma.

What was the source in this case? _____

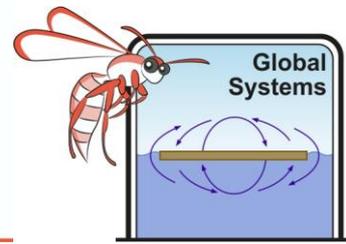
What was the sink in this case? _____

What was the forcing factor in this case? _____

Give two instances of the negative impact from this imbalance, one in the immediate area and another at a distance.

The greatest extinction on Earth (the Great Dying) at the end of the Permian period 251mya was also related to massive outpourings of volcanic lavas in Siberia. 95% of all organisms on Earth became extinct. It took 10 million years for the Earth to recover its biosphere.

Source to Sink – Student Activity



Interesting information



Bhutan is a small kingdom nestled in the Himalayan Mountain Range.

It is the only country in the World that is a carbon sink.

In its constitution it insists that at least 60% of its land must remain forest.

It exports hydro electricity.

The Gross National Happiness Commission is charged with reviewing government policies and allocation of resources.

Dance is the national sport.