THIS SPACESHIP EARTH

DAVID HOULE / TIM RUMAGE

"There are no passengers on spaceship earth, we are all crew"

MARSHALL MCLUHAN

PHOTO: NASA

This special PDF has been created to be downloaded at the web site of This Spaceship Earth, Inc. a 501 (c) (3) non-profit corporation.

Since our book "This Spaceship Earth was published at the end of 2015, the reader feedback has been extremely positive. The majority of readers commented specifically on Chapter 2: The Quartermaster's Report as having opened their eyes and thinking about Climate Change.

The comments fell into two categories:

1. This was the first time, in one place, that a 'state of the planet' or of Spaceship Earth they had ever seen, stated purely **what is** and
2. The reality that everything is connected on Spaceship Earth, that climate change is a planetary issue..

We make the decision to provide this Chapter, along with Chapter 1, https://thisspaceshipearth.org/explore/tse-book/ on our web site as changing consciousness from passenger to crew is the most important thing, more than royalties.

We will be publishing an annual Quartermaster's Report on this web site, so we felt it important to share this first one.

Please share with anyone you think might benefit from reading this.

David Houle Tim Rumage

June 2017

P.S. Please remember we are completely supported by donations as a non-profit. Donations can be made here:
https://thisspaceshipearth.org/donate/

Chapter 2

THE QUARTERMASTER'S REPORT

The Quartermaster supervises, stores, and distributes supplies and provisions. The Quartermaster is also the one responsible for making sure equipment, materials, and systems are available and functioning. This is not about what is preferred or desired, but what is. Therefore, in the world of the Quartermaster, if a 16 oz. glass has 8 ounces of liquid, the glass is neither half full nor half empty—it simply has 8 ounces of liquid.

The purpose of the Quartermaster's Report is to put forth the data that describes the status of the ship, in this case "This Spaceship Earth." The reason for taking a planetary perspective is to realign our individual viewpoints and assumptions about resource quantity, quality, and demand with that of TSE's current operational capability, capacity, and actual status. Inputs, throughputs, and outputs need to be in dynamic equilibrium with each other to maintain the life support systems (LSS) of TSE relative to the health of the crew.

What follows is the report on the current status of Spaceship Earth as of September 2015. Some of the data will be surprising—even alarming to the reader. It is rare for such a broad range of data sets to be presented simultaneously. In doing so, we shift the context of the information from an insular or silo frame of reference to a more holistic and planetary perspective. The data is not interpretive, it is simply factual. We have sought out the most current reports available and have used those publications to establish the Quartermaster's report. There are two questions you might consider as you read the report. First—How well do your assumptions about each topic match the reality of the data? Second—Does the information reflect an outcome that you wish humanity to achieve? Your reflection upon your answers to those two questions will determine your role in defining and creating our common future.

Note: In this book, we have used both the US unit of weight (ton) and the metric unit of weight (tonne) based on how the original data was presented in the report cited. If you wish to do the conversion of units, a metric tonne is 1000 kilograms (kg) or approximately 1.10 US tons or 2,204.6 pounds. A US ton is 2000 pounds or approximately 0.907 metric tons or 907 kilograms.

Quartermaster's Trend-line Summary September 2015

Human population ↑ increasing (estimated to be 8 billion in 2025, and 8.7 billion in 2035)

Life support system TSE ↓ in decline, not passively reversible

Life Support System Components:

Air quality ↓ in decline: not passively reversible

Availability of safe, potable water ↓ in decline, not passively reversible

Habitat quantity, quality, diversity ↓ in decline, not passively reversible

Commercial fish stocks ↓ in decline, not passively reversible

Population of non-human vertebrate species ↓ decline, not passively reversible

Population of assessed plant species ↓ in decline, not passively reversible

Rate of species loss ↑ increasing, not passively reversible

Greenhouse gas emissions ↑ increasing, not passively reversible

Average global temperature ↑ increasing, not passively reversible

Sea level ↑ rising and Rate of sea level rise ↑ increasing (Neither are passively reversible given current trends in greenhouse gas emissions.)

Extreme weather events ↑ increasing, not passively reversible

Waste generation ↑ increasing, not passively reversible

Note: "not passively reversible" means that the trends can only be reversed through active engagement and continuous commitment to improve and repair the system.

Quartermaster's Report—September 2015

Crew on board

Current human population: 7,307,492,161

Current net population/crew growth rate is 148 people per minute.

World Population milestones:

1804 1 billion

1927 2 billion

1960 3 billion

1975 4 billion

1987 5 billion

1999 6 billion

2011 7 billion

2025 8 billion—estimated

2043 9 billion—estimated

Since the first manned space flight on April 10, 1961, TSE's human/crew population has increased by 233%.

The status of the human crew:

Status	Population
Illiteracy	122 million youth crew members
Lacking minimum literacy skills	775 million adult crew members
Chronically undernourished	805 million crew members
Overweight	1.3 billion crew members
Obese	600 million crew members 18 and older
Overweight or obese	42 million crew members age 5 or younger
No access to clean water	783 million crew members
Not enough access to clean water for adequate sanitation	2.5 billion crew members
No access to safe and affordable surgery	4.8 billion crew members
Asthma	334 million crew members
No access to electricity	1.3 billion crew members
Rely on the use of biomass for cooking	2.7 billion crew members

Status of the life support system of TSE

Air quality

- 1 in 8 global deaths is attributable to air pollution exposure.
- Air pollution is considered the largest single environmental health risk.
- More people die from air pollution exposure than die from lung, liver, stomach, bowel, breast, esophageal, pancreatic, prostrate, and cervical cancers combined.
- Air pollution kills more people than a combination of smoking, diabetes, and road deaths.
- Air pollution was also linked to low birth weight in babies, miscarriages, pediatric cancer, asthma attacks, and reduced fertility in both males and females.

Water availability

- The total volume of water of Earth/TSE is estimated at 1.386 billion km^3 (333 million cubic miles), with 97.5% being salt water and 2.5% being fresh water.
- Of the fresh water, only 0.3% is in liquid form on the surface.
- Of the liquid surface fresh water, 87% is contained in lakes, 11% in swamps, and only 2% in rivers.
- Water is increasingly in short supply due to growing demands from agriculture, an expanding population, energy production, and Climate Change.
- A billion people on TSE lack access to safe drinking water.
- 700 million people suffer today from water scarcity.
- 2.7 billion find water scarce for at least one month of the year.
- Agriculture uses 70% of the world's/TSE's accessible freshwater.

The total volume of water of Earth/TSE has not changed while there has been life on TSE. The amount of water is the same as it was 1 million years ago.

Water quality

- Unsafe or inadequate water, sanitation, and hygiene cause approximately 3.1% of all deaths worldwide.
- Unsafe water generates 4 billion cases of diarrhea per year resulting in 2,200,000 deaths per year—mostly in children under the age of 5.
- Every day, 2 million tons of sewage and other effluents drain into the world's waters.

We add 800,000,000,000,000 plastic microbeads to the wastewater treatment system everyday in the USA. An estimated 8 trillion of those microbeads are discharged into aquatic environments daily. The remainder of the microbeads are trapped in the solids or sludge of the settling tanks and may re-enter the environment depending upon how the solids and sludge are processed.

Every year, more people die from unsafe water than from all forms of violence, including war.

Aquatic and marine environments

- Marine vertebrate populations have declined by 49% between 1970 and 2012.
- Tropical Reefs have lost more than half their reef-building corals over the last 30 years.
- Globally, there are 405 dead zones (places with too little oxygen to support marine life) in coastal waters. Collectively, they comprise an area of 95,000 square miles and the number of dead zones increased by 33% between 1995 and 2007.

In 1997, Charles Moore discovered a region of the Pacific Ocean with a large amount of plastic debris. This area is commonly referred to as the Great Pacific Garbage Patch (GPGP). While the gyre resulting from ocean currents defines the location of the garbage patch, it is land-based plastics and marine debris that constitute the make-up of the GPGP. Plastics do not biodegrade but physically break down into smaller and smaller pieces over an extended period of time. The slow rate of mechanical break down of plastics combined with the high volume of use of plastics results in the growing dimension of the GPGP. Subsequent to the discovery of the GPGP, 4 other garbage patches have been found—one in each ocean. In 2013, UNESCO symbolically recognized the Garbage Patch Nation comprised of the 5 areas of concentrated discarded material—one in each major gyre of the North Pacific, the South Pacific, the North Atlantic, the South Atlantic, and the Indian Ocean. At the time of recognition, the population of the Garbage Patch Nation consisted of an estimated 36,939 tons of garbage and covered an area of 15, 915,933 square miles. It is estimated that 80% of the population is from land-based sources.

Food supply

<u>Fish stocks</u>

- Overexploited/depleted stocks are at 30% (up from 10% in 1974).
- Fully exploited fish stocks are at 57% (up from 51% in 1974).
- Non-fully exploited fish stocks are at 13% (down from 40% in 1974).
- Populations of the fish family that include tuna, mackerel, and bonito, have fallen by almost 75% since 1970.

Live stock population

- 19 billion chickens
- 4.5 billion cattle, sheep, goats, and pigs

Land use

- Humans have modified more than 50% of the Earth's land surface.
- 26% of TSE's ice-free land is used for livestock grazing.
- 33% of the croplands on TSE are used for livestock feed production.
- Current loss of arable land is 46,332 sq. miles/yr (12,000,000 hectares/year) due to drought and desertification. This rate is 30–35 times the historical rate.
- Half of the topsoil on TSE has been lost in the last 150 years.
- Rate of deforestation: 46,000-58,000 square miles per year (11–15 million hectares/yr).

Climate

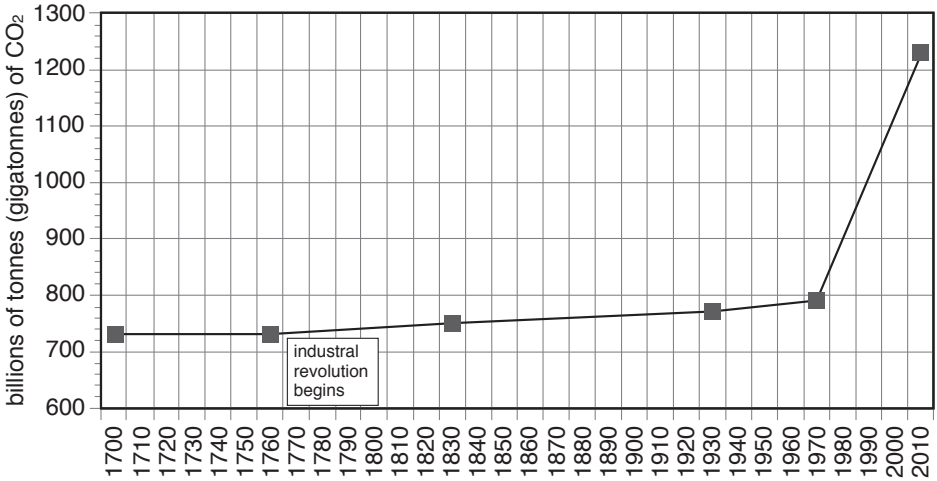
The 2012 estimate for global anthropogenic CO_2 emissions was 34,500,000,000 tonnes, which is the equivalent of launching **273 elephants/sec** into the air for an entire year—assuming an average elephant body weight of 4 tonnes.

Since the industrial revolution:

- Atmospheric CO_2 has risen from 280 ppm to 401.52 ppm (31 March 2015). The increase in CO_2 has not been linear.
- From 1850 to 1950, CO_2 levels rose from 288ppm to 315 ppm, an increase of 27 ppm over 100 years.
- From 1950 to 2015, CO_2 levels have risen from 315 ppm to 401 ppm, an increase of 86ppm in 65 years.
- In 1950, CO_2 emissions were just over 6 billion tonnes per year.
- Now CO_2 emissions are 34.5 billion tonnes per year.

The current atmospheric CO_2 levels are the highest they have been in 800,000 years. Homo sapiens have been on TSE for 200,000 years.

Resident CO_2 In The Atmosphere From 1700 To 2010



Sea level

- Prior to 1900, sea level in the modern era had been relatively constant.
- From 1900 to 1990, tide gauge data indicates that sea level was rising at approximately 0.047 inches per year (1.2 mm per year).
- From 1990 to 2010, sea level rose at a rate of 0.12 inches per year (3mm per year) or 2.5 times faster than it had in the previous 90 years.
- The Global Mean Sea Level has risen 4 to 8 inches since 1900.

Average global temperature

- The average global temperature in 2014 was 58.42 F (14.68C), which was 1.22 F (0.68 C) above a 1951–1980 average.
- 2014 marked the 38th straight year in which the global average temperatures were above the 20th century average.
- May, June, August, September, October, and December of 2014 were all the warmest months on record, globally.
- The amount of warming is not uniform across the planet, with the greatest warming occurring between 40N and 70N Latitude.

Species

- The population of non-human vertebrate species has declined by 52% since 1970.
- Currently, 25% of all mammal species, 12.5% of all bird species, 33% of all amphibian species, and 70% of all assessed plant species are considered threatened or endangered.

Waste

- 1,300,000,000 tons of the food produced for human consumption is lost and/or wasted every year. That is approximately 1/3 of the food produced.
- Approximately 1/3 of the worldwide fisheries catch of 93 million tons is wasted—thrown back into the sea dead or dying. This bycatch is not included in the above data.
- Globally, we generate 1,300,000,000 tonnes of municipal solid waste per year.
- The average American throws out 5 pounds of trash per day.
- 500 pounds of non-biodegradable plastic enters the marine ecosystem every second.
- Over 58% of the total amount of energy produced in the United States from all sources is lost before reaching the appliance.

The increase in pollution coupled with the degradation of resources is an indication that TSE is currently being operated outside its margins of safety.

At present, humanity is operating TSE at a level that would require 1.6 TSEs to balance both the consumption of resources and the generation of pollutants with TSE's bio-capacity to generate useful biological material and absorb waste. Humanity has pushed TSE 60% over the red line, and the overshoot is increasing.

Humanity's ecological footprint

The number of Planet Earths we need to meet our demand for renewable resources and absorption of our waste is measured by ecological footprint.

Year	Humanity's Global Footprint
1961	0.75
1965	0.82
1970	***1.00***
1975	1.10
1980	1.15
1985	1.14
1990	1.22
1995	1.25
2000	1.30
2005	1.46
2010	1.50
2015	1.56

Humanity's ecological footprint was first calculated in 1961. At that time, humanity operated in a manner that maintained a surplus of resources. By 1970, humanity was in a break-even model of demand for resources relative to the regeneration of resources. Unfortunately, in the early 1970s, we crossed the line and ever since have been operating with a growing deficit. It now takes the capacity of more than one Planet Earth to meet our demands and neutralize our waste.

Since 1961, humanity's ecological footprint has more than doubled, increasing from 0.7 planets/TSEs to 1.6 planets/TSEs. The largest change has been in the carbon footprint, which has increased from 36% of the footprint to 53%. In 2014, Earth Overshoot Day was August 19th. Earth Overshoot Day is the date on which humanity consumption of resources exceeds TSE's capacity to regenerate those resources in a year.

Year	Overshoot Date
1987	December 19
1990	December 7
1995	November 21
2000	November 1
2005	October 20
2010	August 21
2014	August 19
2015	August 13

The Quartermaster's Report is a current snapshot of humanity's interaction with TSE. The report is numerically factual. Readers and users of the report can interpret the information for themselves, with the proviso that their review includes the full data set not just selective parts.

In reviewing the Quartermaster's Report, the authors feel that several questions come to the forefront.

- Did the crew know this was the status of TSE?
- Is this what the crew wanted the status of TSE to be?
- How did this become the status of TSE?
- And finally, how can the crew operate TSE to insure the vitality and viability of the LSS (life support system) for the intended journey into the future?