

Investigative Science

Learning goal: Understand the concept and consequences of exponential growth in a population.



Wednesday, September 11, 2019

Welcome to Investigative Science with Mr. Fireng

1. Get out your stampsheet/warm-up packet
2. Get out your **interactive journal**
3. Take out **homework** from binder and put on desk (this may be in your interactive journal).
4. Get out agenda from binder. Write your **homework for the next day in your agenda**, fold agenda back and leave open your agenda open on you desk.
5. Put Binder Away (in backpack or underdesk)

Start warm up. If you are not ready and working at the end of the 3-min drill you will lose your participation points.



4	Human pop growth scenarios
3	Trends and prediction in human pop
2	Define and id exponential growth
1	Define Exponential growth

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Learning goal: Understand the concept and consequences of exponential growth in a population.



Learning goal: Understand the concept and consequences of **exponential growth** in a population.

Learning scale:

1	2	3	4
Define exponential growth.	Define and identify exponential growth in a sample population.	Understand trends in human population growth and make logical predictions.	Use multiple data sets from the past and present to explain likely scenarios of unchecked human population growth.

Student's self-evaluation: *Complete at home or at the end of class, use the 4-3-2-1 Learning scale (two to three sentences).*

Homework: none.

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Ecological Footprint

What is an Ecological Footprint?

What is the Biocapacity?

How are ecological footprints measured?

What is an Ecological deficient or “debtor”

What is an Ecological reserve Or “Creditor”

Summary

4

Human population growth scenarios

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Define and identify exponential growth

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EASTER ISLAND: Statistics

- There is clear evidence that Easter Island once was a heavily populated (perhaps 20,000 people) and rich society.
- There is clear evidence that this big population collapsed and most of the population died.
- When the Europeans first arrived in 1722, there were approx 2,500 natives.
- In 1877 there were only 110.

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Collapse

Rapa Nui (Easter Island) must have seemed like paradise to the first natives of perhaps 100 people.

- Forests
- Seafood
- Plenty of space

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Reasons for collapse

- Cults formed and statues were built to worship the cults.
- Many trees were cut down in order to move the statues Rats ate the seeds leaving the island without trees
- Boats slowly disappeared so people could no longer fish.
- The soil washed into the sea because there were no trees.

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Why? What?

- Why didn't they stop before it was too late?
- What were they thinking when they cut down the last tree?
- What can WE learn from the history of Easter Island?

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Three Pillars of Sustainability

Easter Island versus Earth: location and isolation



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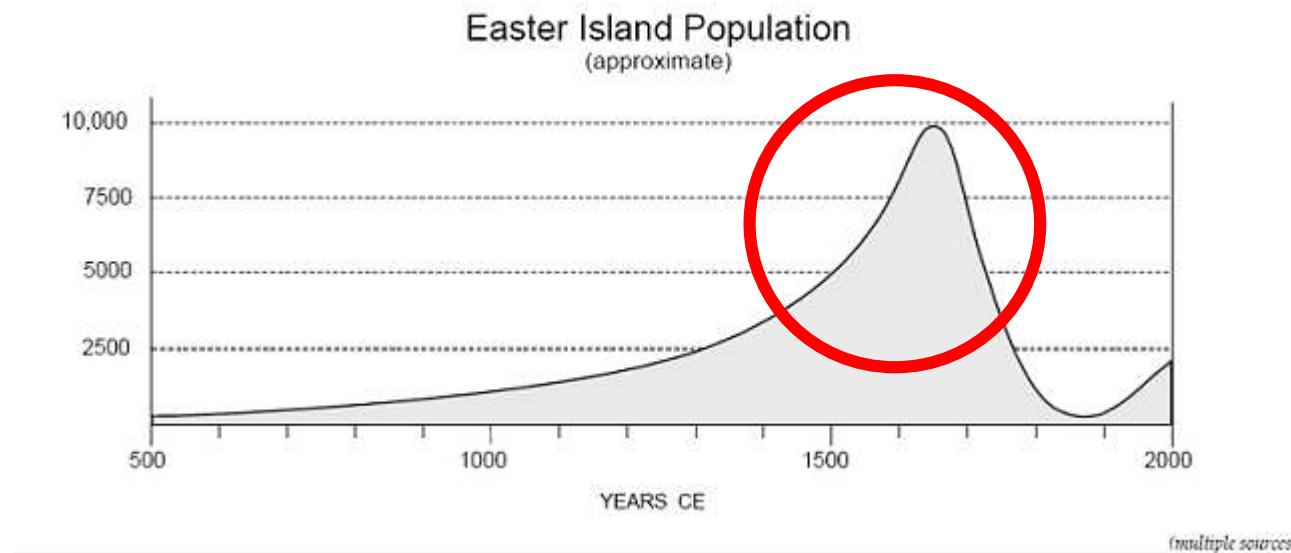
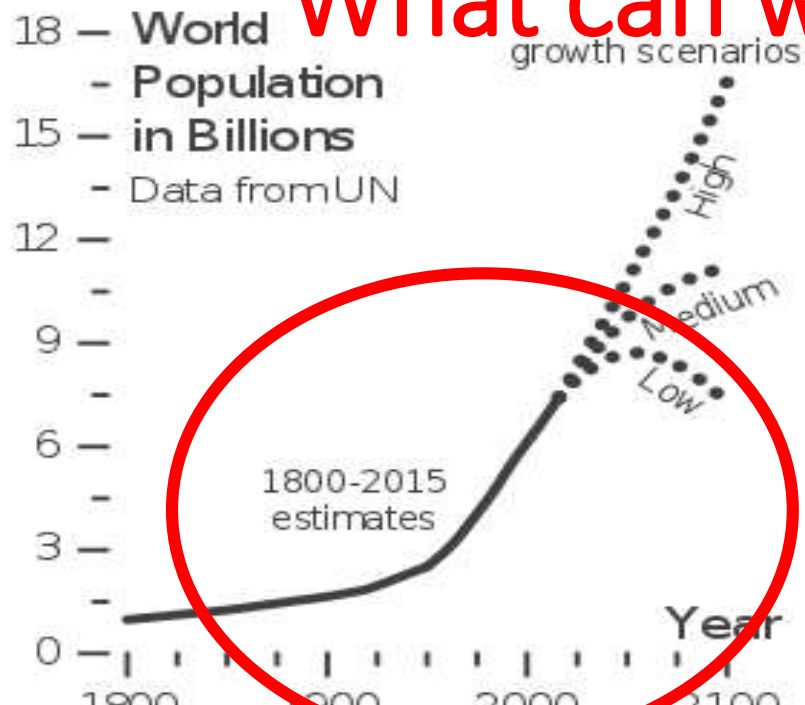


EASTER ISLAND: A model of population collapse.

Collapse: 20,000 to 100 in just a couple years

Rapa Nui (Easter Island) must have seemed like paradise to the first natives of perhaps 100 people.

What can we learn from their mistakes??



- 1 Define Exponential growth
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- 3 Trends and prediction in human pop
- 4 Human population growth scenarios

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How do we measure impact?

Are We Getting Too Big For Our House?



Youth
for Exchange
and Understanding

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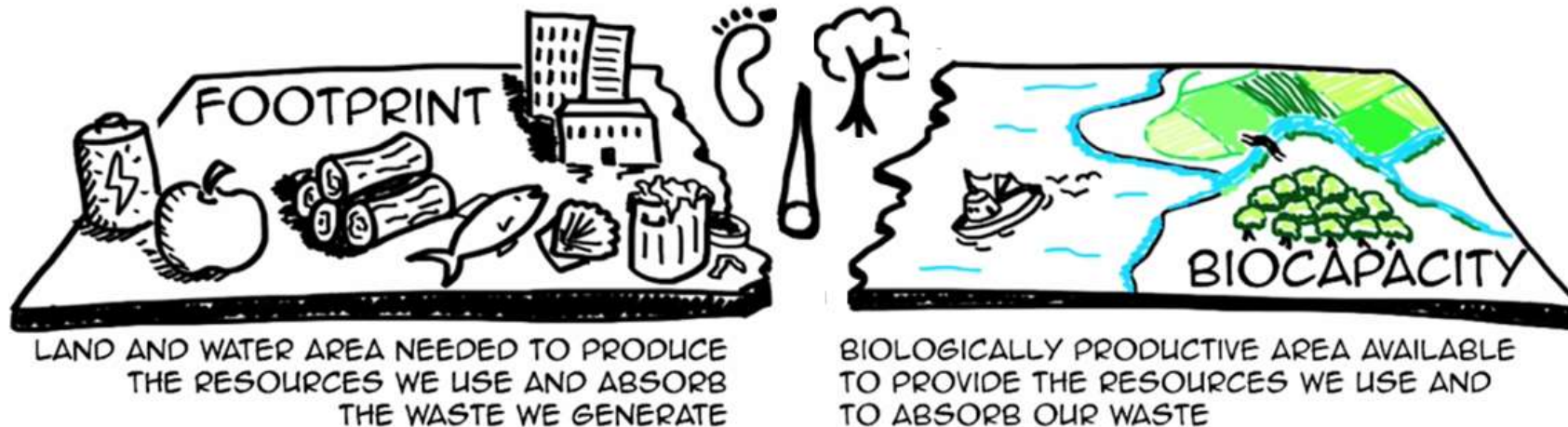
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What is an Ecological Footprint?

The Ecological Footprint **measures the area of biologically productive land and water required to provide the resources used and absorb the waste generated by human activity.**



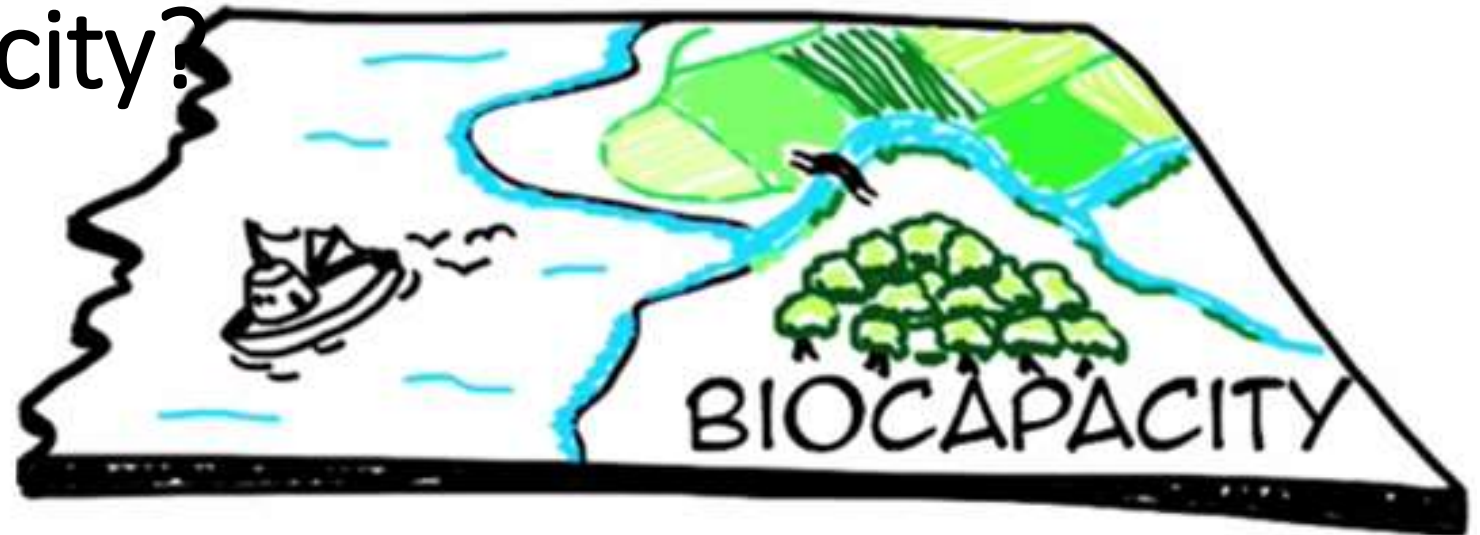
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What is the Biocapacity?



Biologically productive area available to provide the resources we use and to absorb our waste generated by human activity.

Define and
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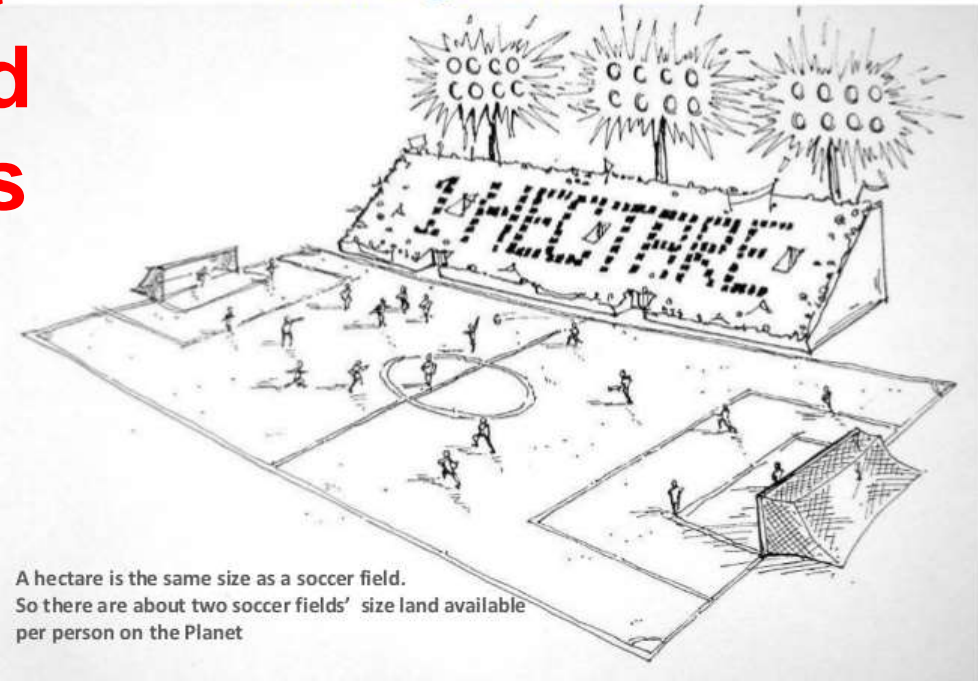
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Ecological Footprint is Measured in “Hectares”

Both the Ecological Footprint and biocapacity are measured in units called global hectares (gha). One gha represents a hectare of forest, cropland, grazing land or fishing grounds with world average productivity

How Big is a Hectare?



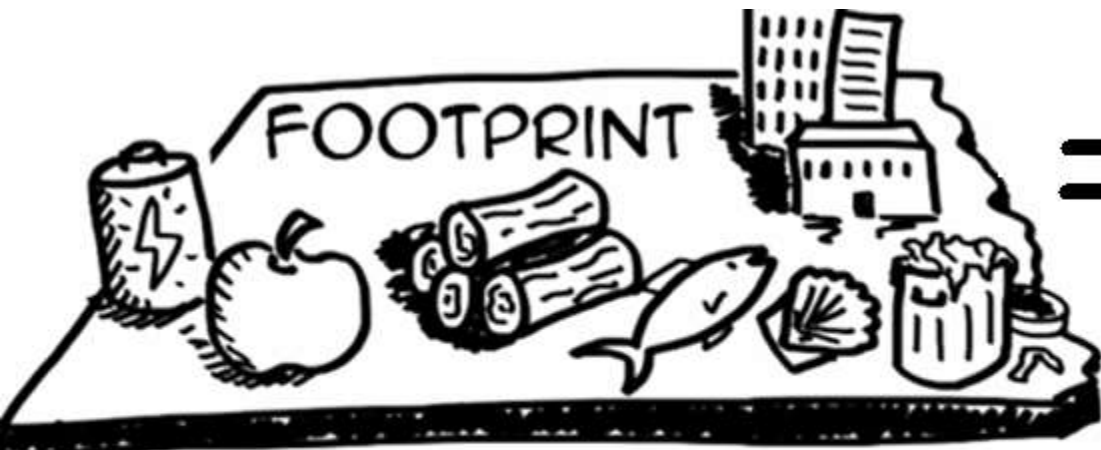
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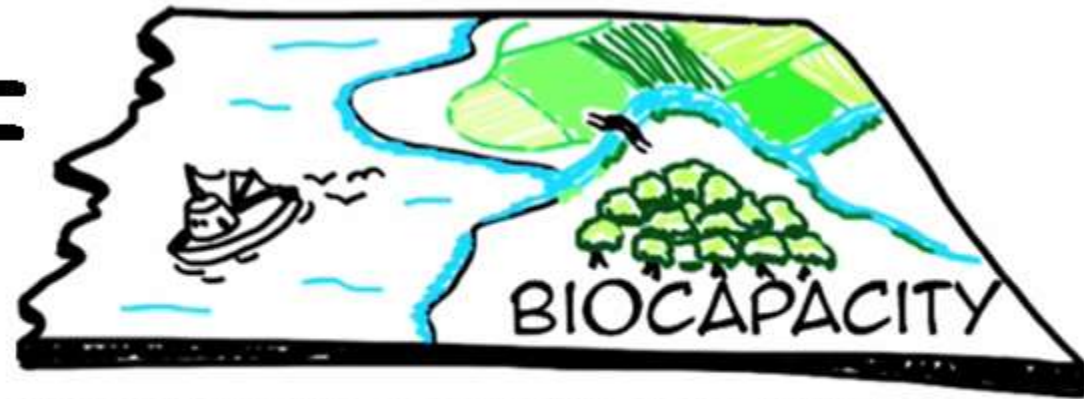
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If the **ecological footprint** is equal to bio capacity all is good! The Earth's **biocapacity** is meeting our needs!



=



LAND AND WATER AREA NEEDED TO PRODUCE THE RESOURCES WE USE AND ABSORB THE WASTE WE GENERATE

BIOLOGICALLY PRODUCTIVE AREA AVAILABLE TO PROVIDE THE RESOURCES WE USE AND TO ABSORB OUR WASTE

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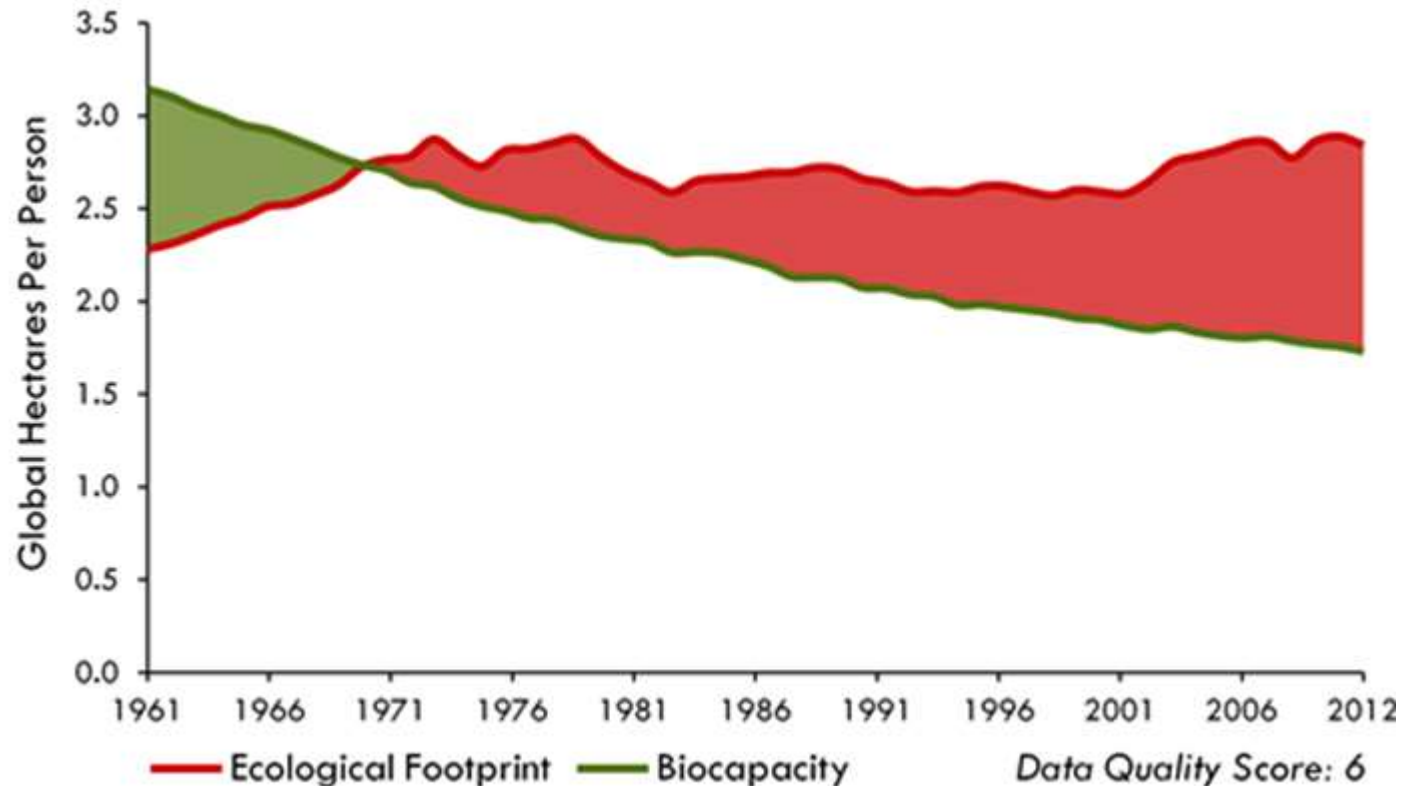
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Graph of **ecological footprint** as *Global Hectares per person vs. Year.*

This illustrates how the foot prints have changed over time



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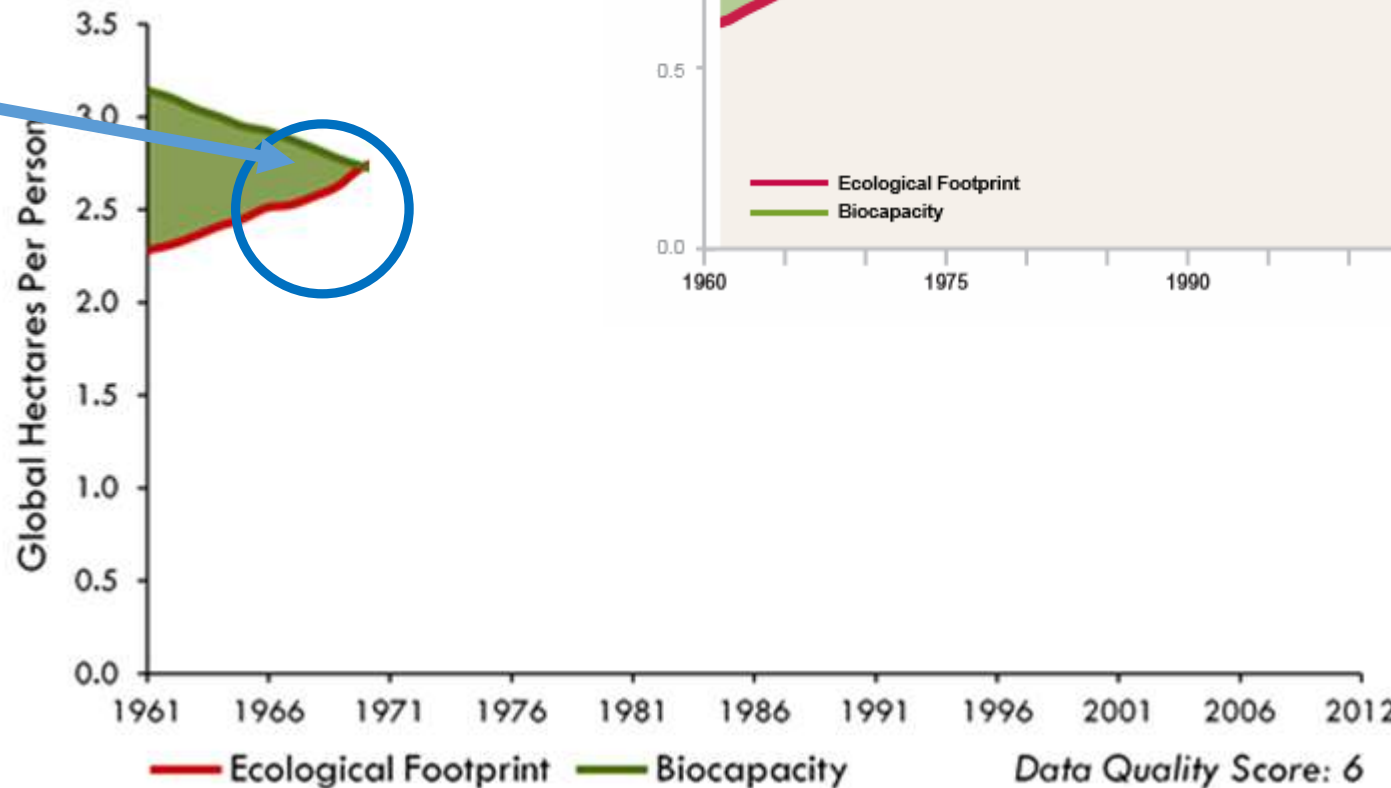
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In 1971 the world average **ecological foot print** was **2.7** global hectares and the **biocapacity** was **2.7** hectares! Yeah!

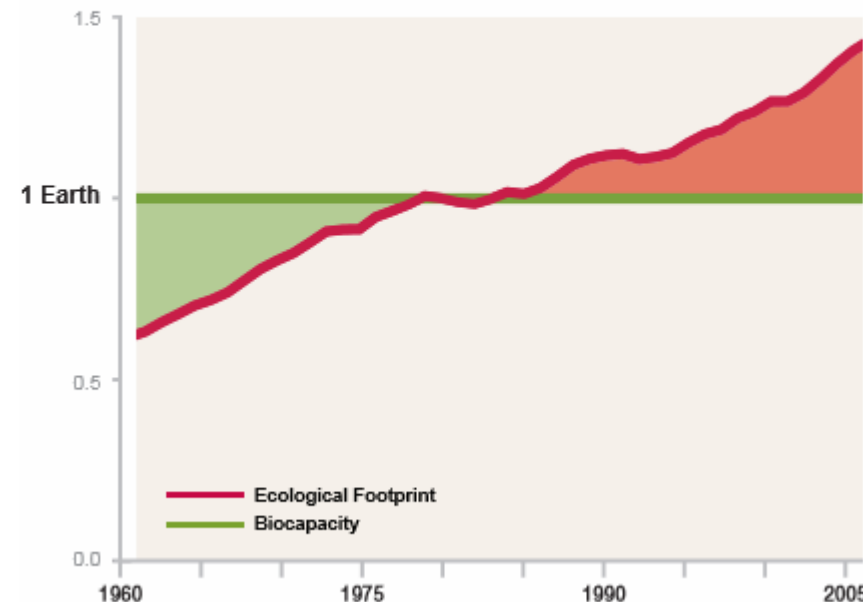
On average we use one “Earth” of resources!

World



GLOBAL ECOLOGICAL LIMITS

Figure 1: Human Demand on the Biosphere, 1961-2006



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Data Quality Score: 6

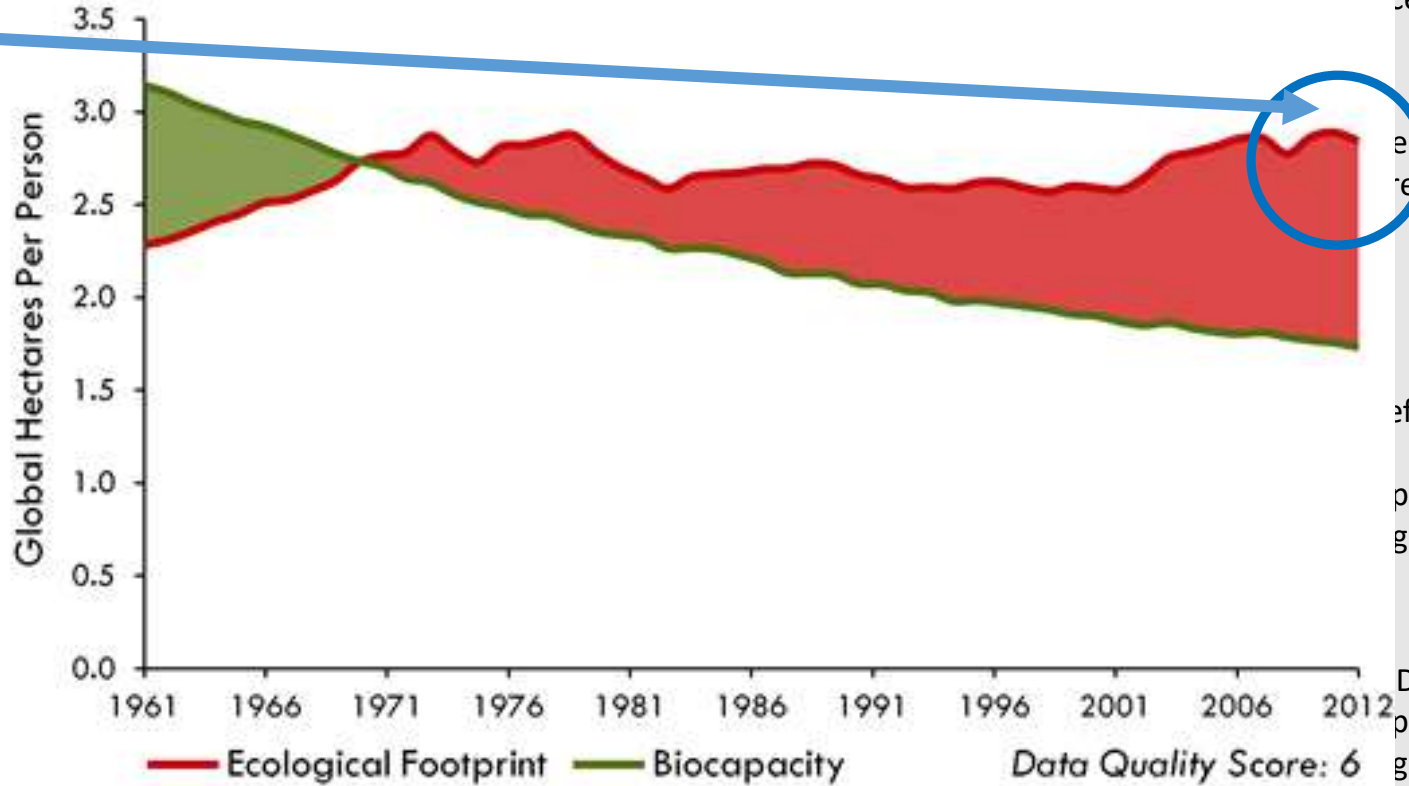
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The world-average ecological footprint in 2012 was **2.7 global hectares per person**

World



- 1 Define potential growth
- 2 Refine and identify potential growth
- 3 Trends and prediction human pop
- 4 Human population growth scenarios

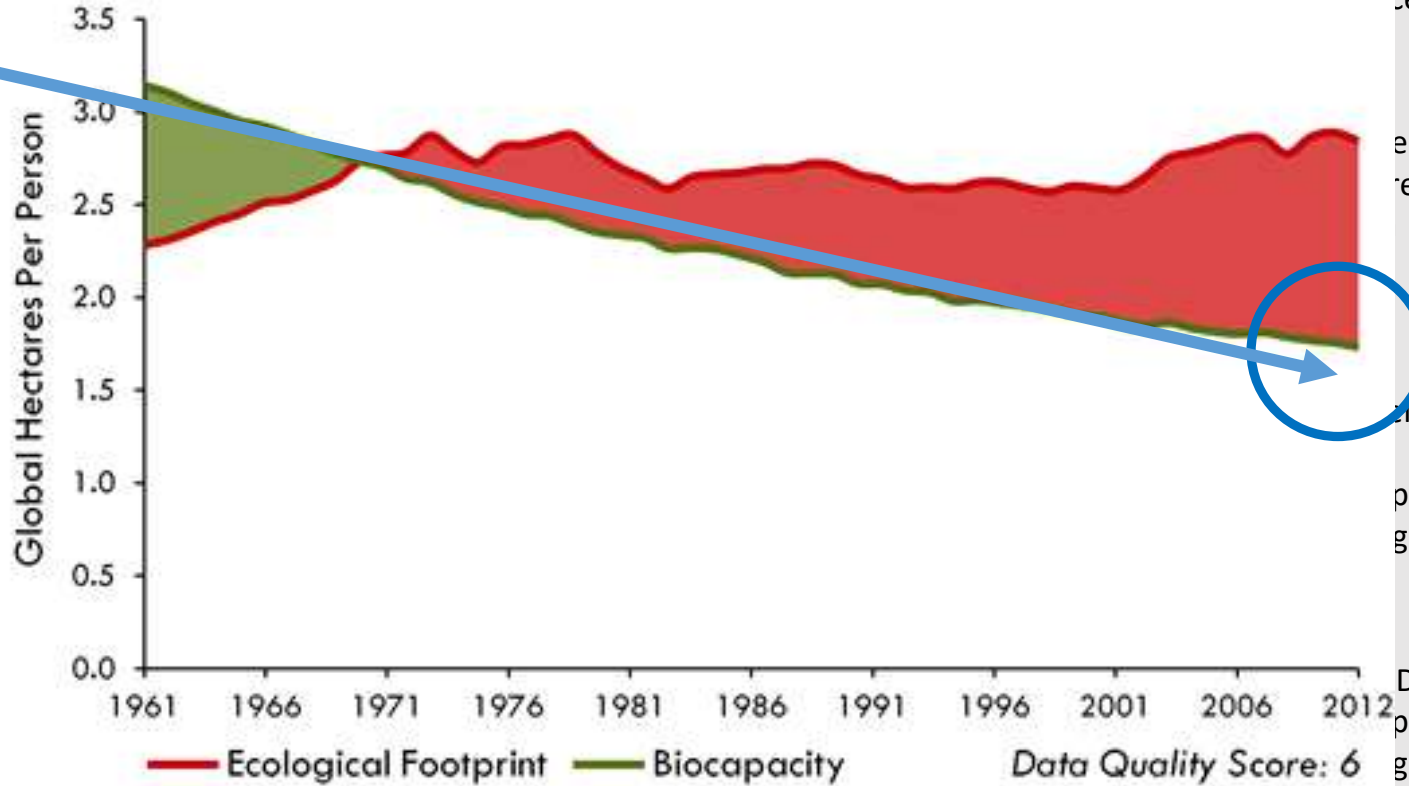
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The world-average biocapacity was 1.8 global hectares per person

World



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Data Quality Score: 6

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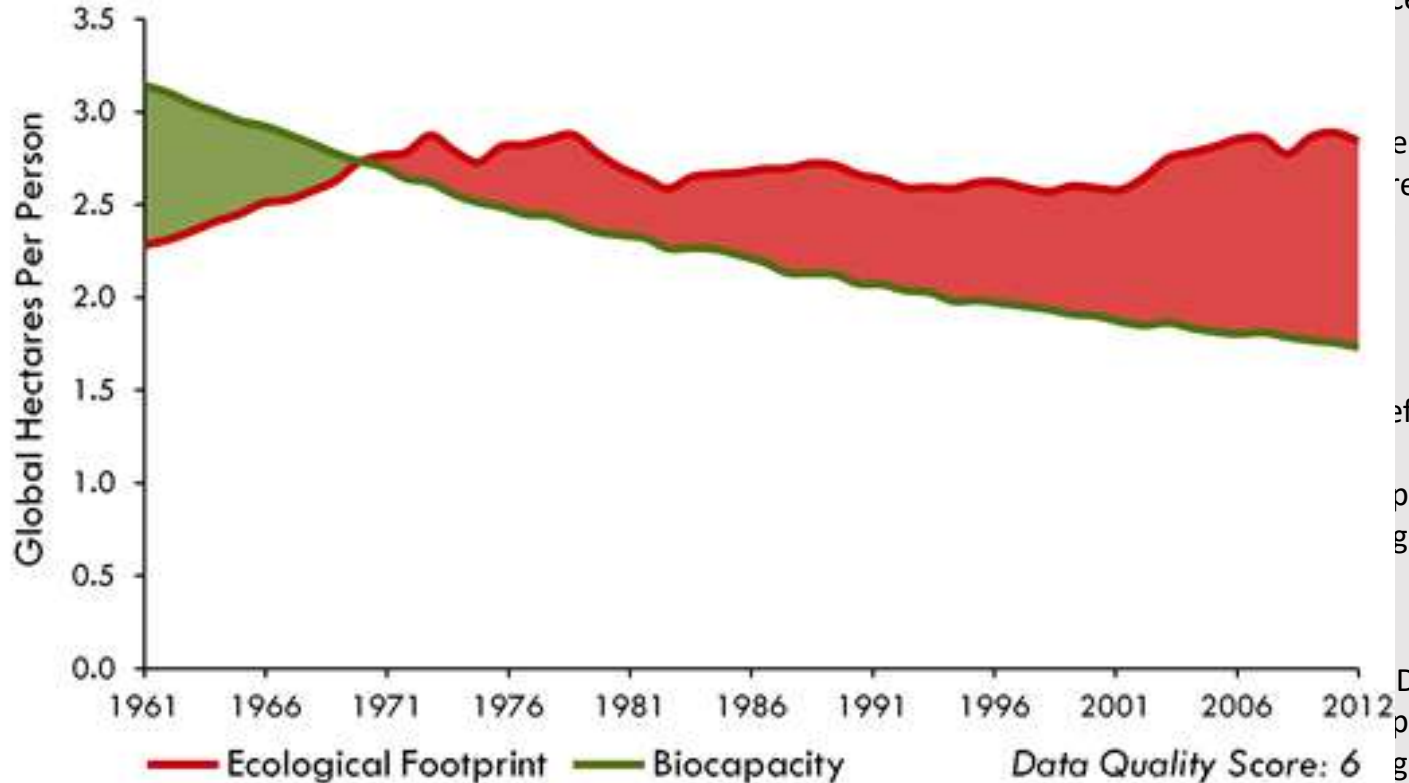
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This leads to an Ecological deficit Or “Debtor”

An ecological deficit occurs when the Footprint of a population exceeds the biocapacity of the area available to that population.

World



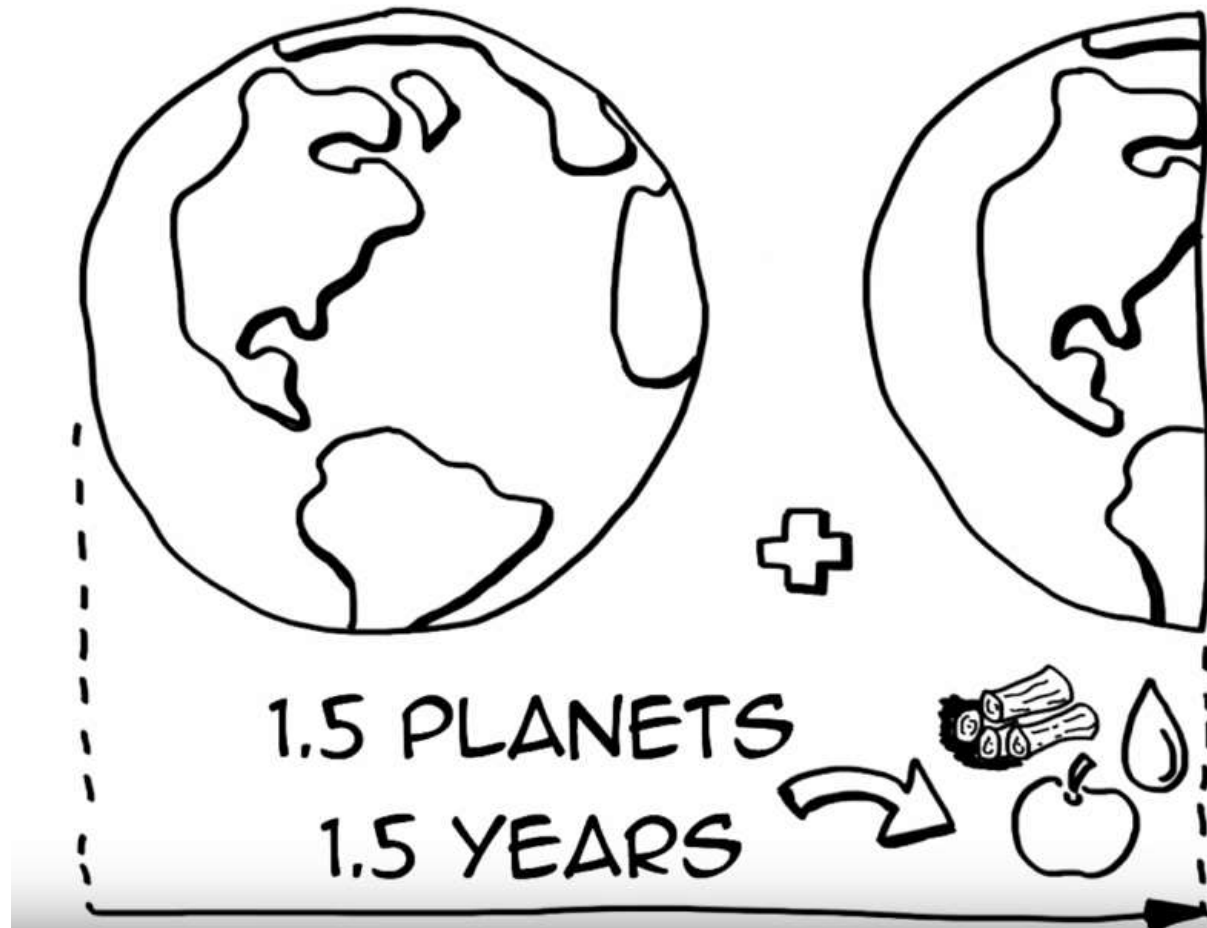
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This means we would need 1.5 planets to meet the needs of the human race.



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Another way to view it is called the overshoot day.

This is the day of the year when we have exhausted one of "Earth's resources"

This date gets earlier and earlier every year



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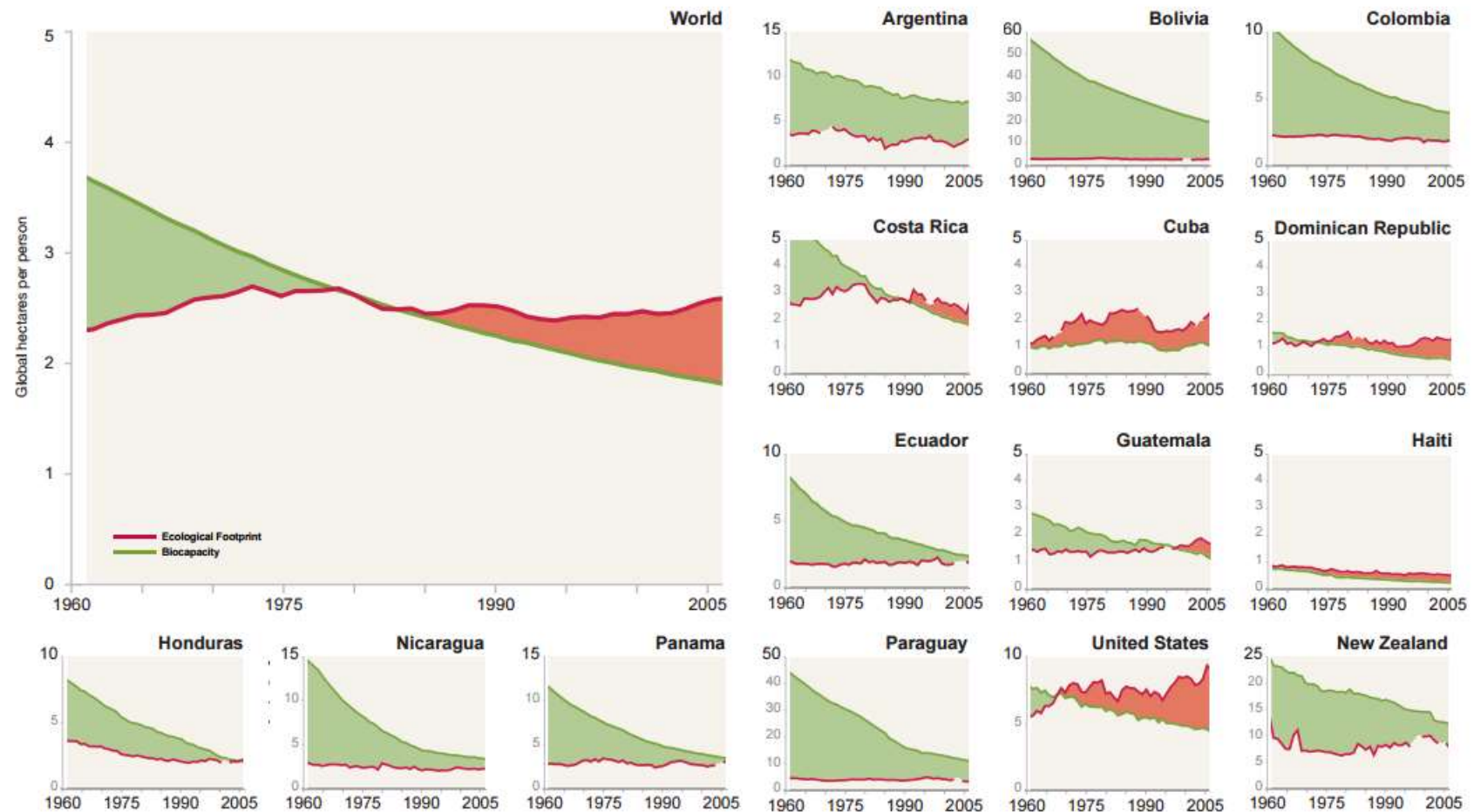
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Patterns of Ecological footprints

What do you notice?

WORLD, LATIN AMERICA, NORTH AMERICA, AND OCEANIA ECOLOGICAL FOOTPRINT AND BIOCAPACITY, PER CAPITA, 1961-2006



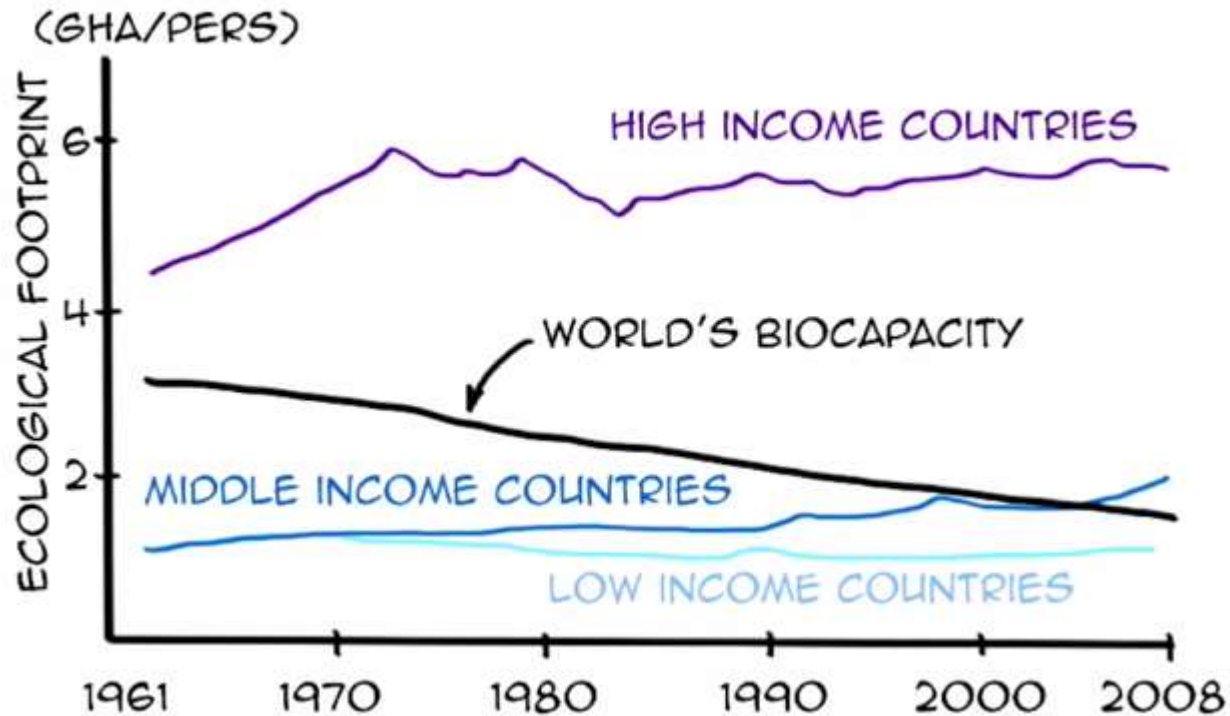
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What is the pattern for countries that have a deficit or a reserve?



In general, high income countries have a greater Ecological foot print

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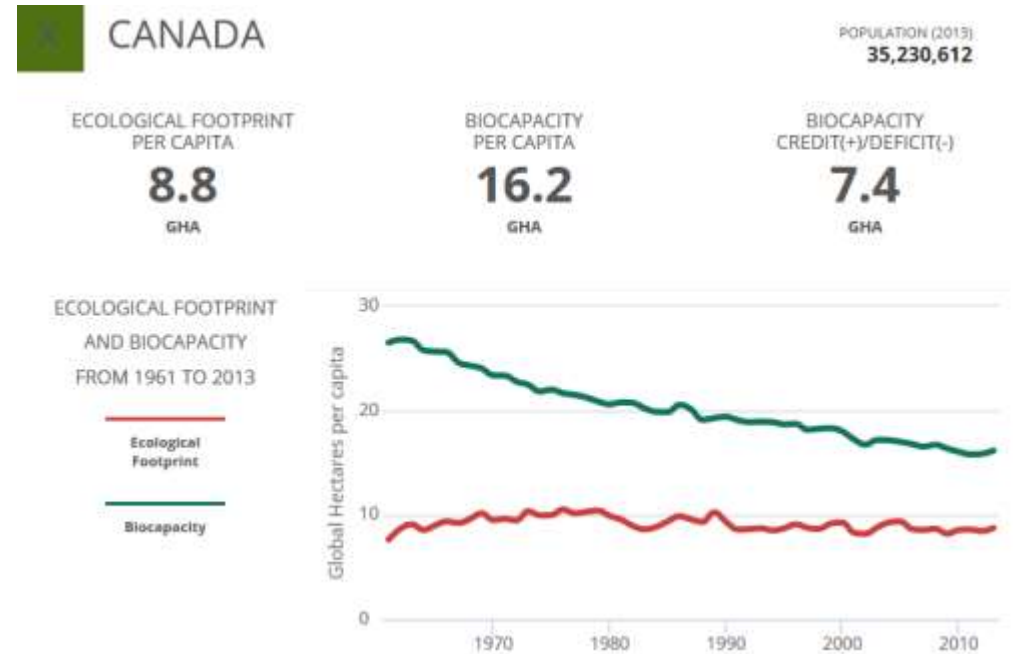
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Ecological reserve Or “Creditor”

An Ecological reserve exists when the biocapacity of a region exceeds its population's Footprint.



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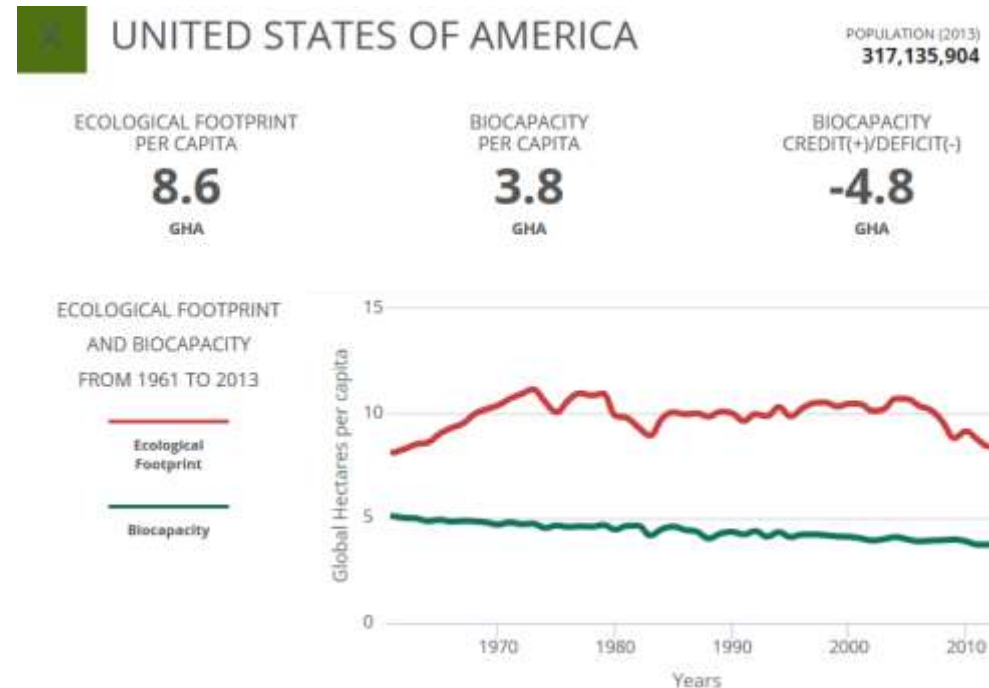
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Ecological deficit Or “Debtor”

An ecological deficit occurs when the **footprint** of a population exceeds the **biocapacity** of the area available to that population.



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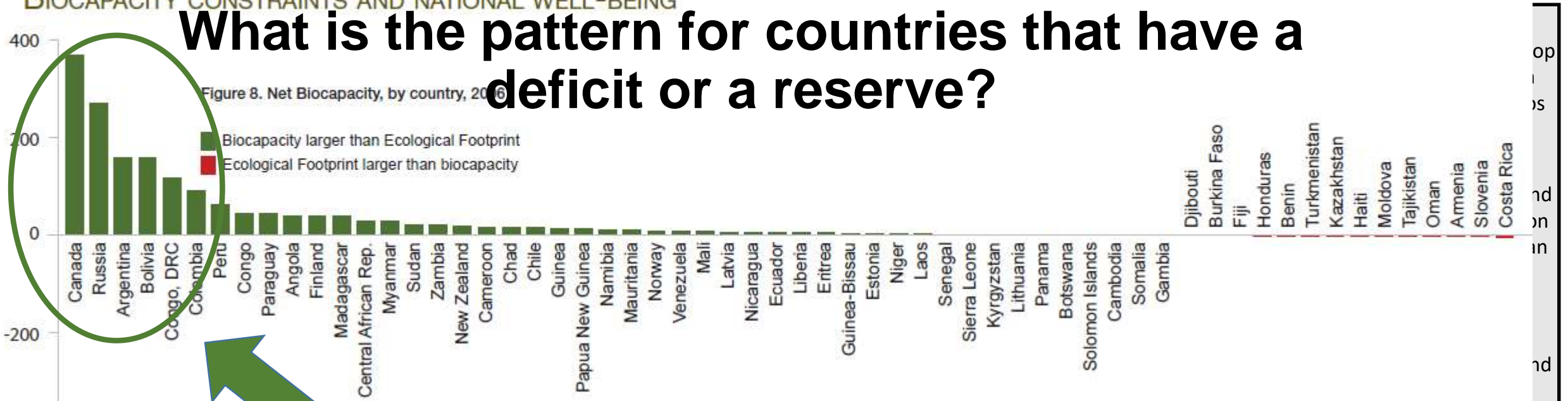
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BIOCAPACITY CONSTRAINTS AND NATIONAL WELL-BEING

What is the pattern for countries that have a deficit or a reserve?

Figure 8. Net Biocapacity, by country, 2016

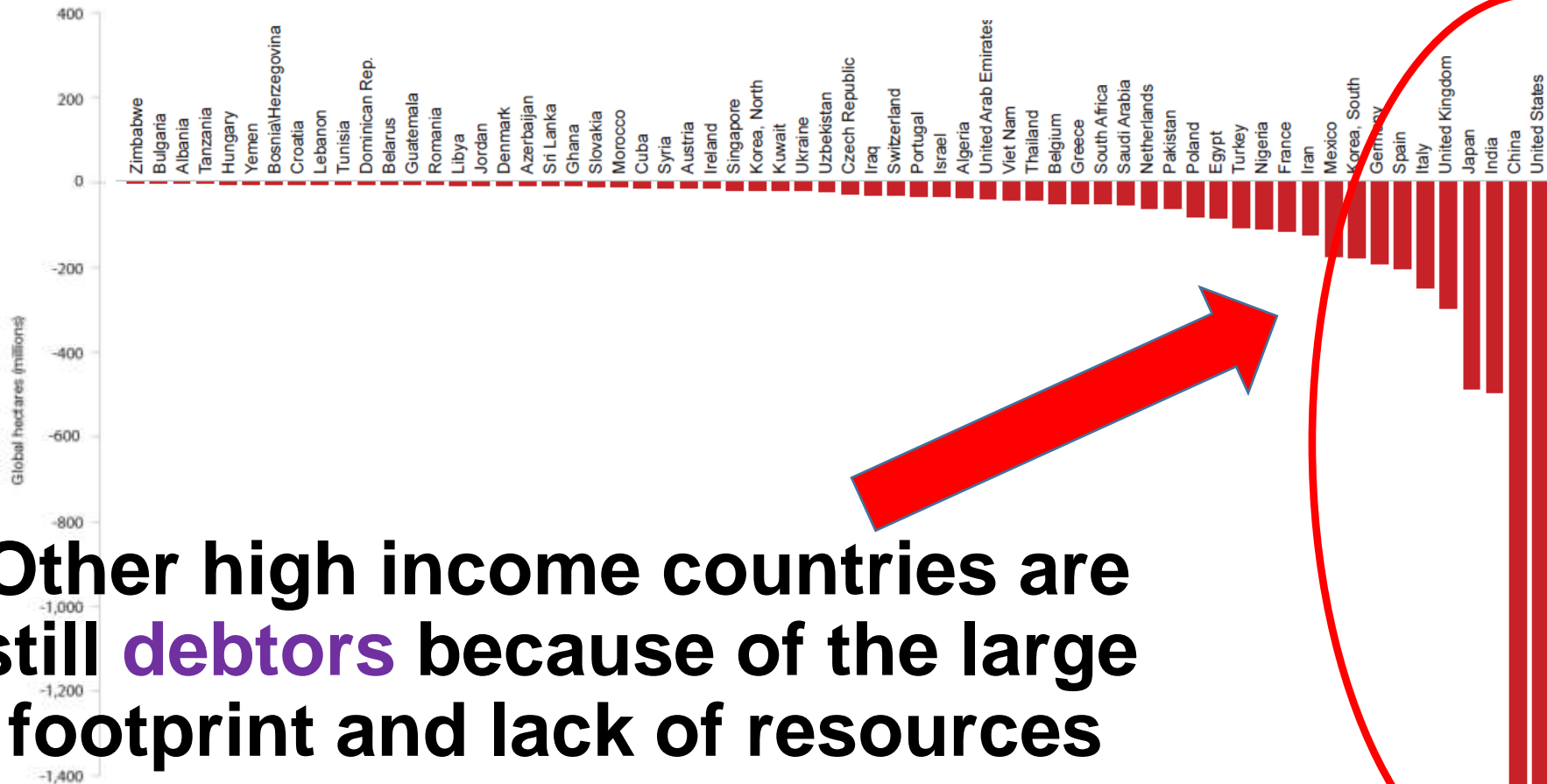


Some high income countries with a high footprint are still ecological creditors because of their size and ecology

exponential growth
1
Define Exponential growth

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Other high income countries are still **debtors** because of the large footprint and lack of resources

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Ecological Footprint Video:

https://www.youtube.com/watch?v=g_aguo7V0Q4



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