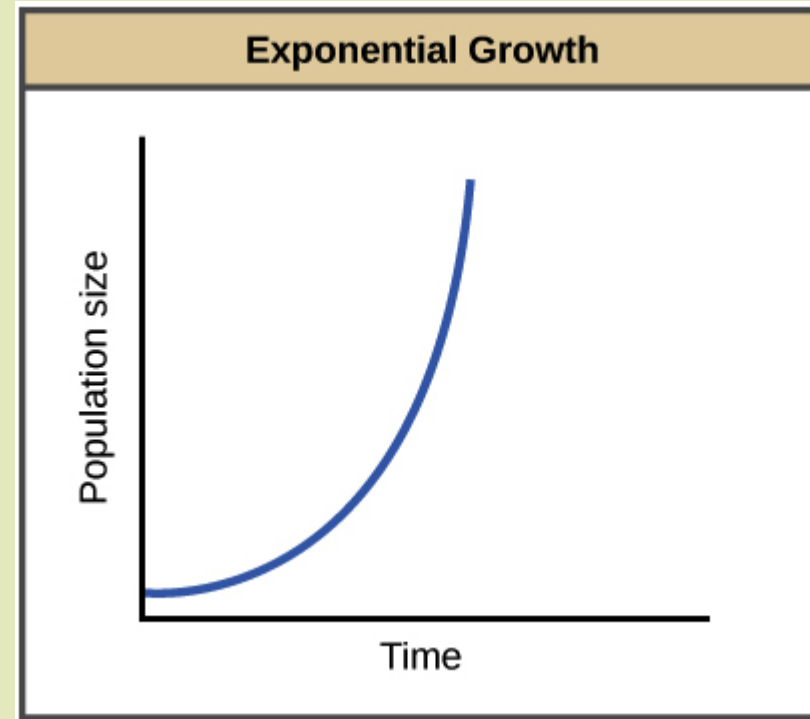


Exponential Growth

What is it?

Why it is so difficult to appreciate?

Why can it be so dangerous?



The Lily Pond Story

On day 1
someone puts
one lily pad in
the pond

The lily pad
population
doubles in
coverage of
the pond
surface every
day.

Assume on day
30 the pond is
fully covered
suffocating all
life in the pond.



You are
observing the
pond every day.

On what day
you begin to
realize that the
pond is in
trouble?

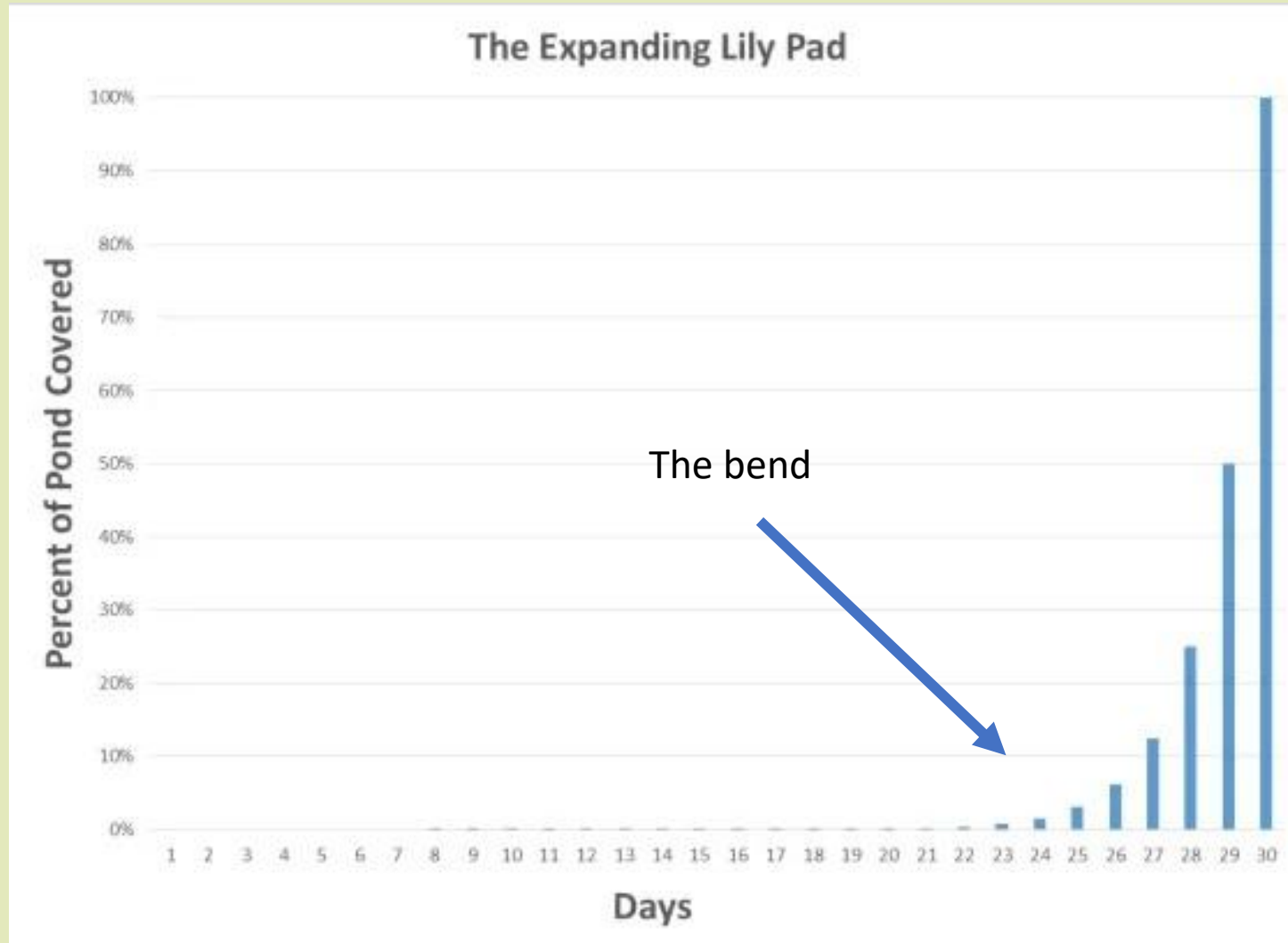
Following The Lilly Pads Growth

Day 30	100%	covered	< its over; the pond is dead
Day 29	50%	covered	< you scramble to solve the problem
Day 28	25%	covered	< you realize you have a problem
Day 27	12.5%	covered	< you start thinking about a possible problem
Day 26	6.25%	covered	< no problem
Day 25	3.125%	covered	< certainly no problem
•			
•			
Day 1	0%	covered	< absolutely no problem



Exponential Growth Curve

The
hockey
stick
curve



Note when you get to the bend in the curve, things are about to spiral out of control and there is very little time to react and change course

Human Population Growth

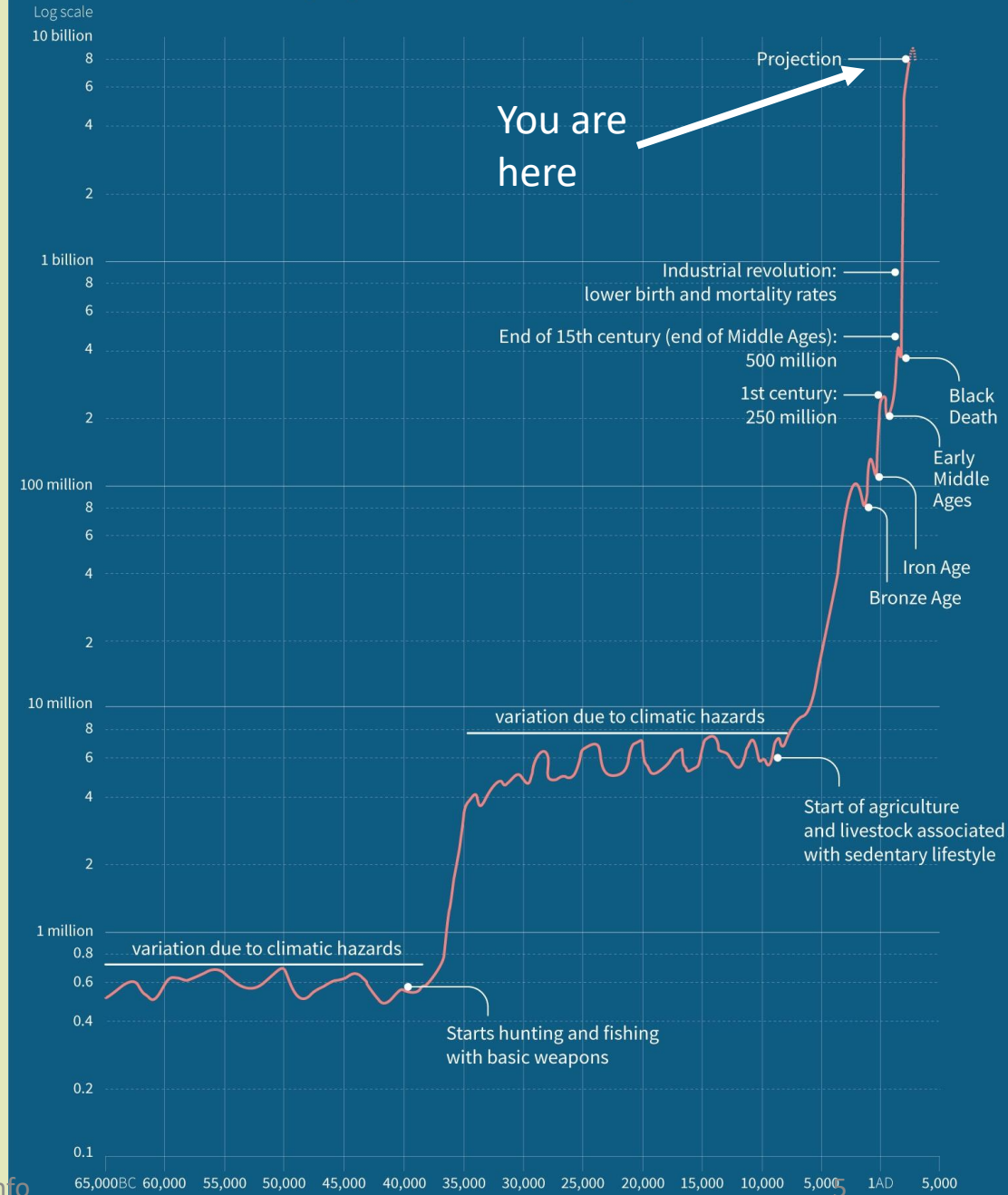
65,000 BC – 2100 AD

Note where we are on the curve now (in 2025)

Do you think we might have a problem?

www.grokingwholeness.info

The rise in world population since 65,000 B.C.



Source: INED (French Institute for Demographic Studies), early data based on estimates

AFP

What Follows Exponential Growth of a Population?

Ever Increasing demands for:

- Foods (plant and animal)
- Fresh Water
- Energy
- Housing
- Clothing
- Appliances
- Medical and Dental Services
- Sanitation & waste disposal
- Transportation
- Entertainment: TVs, PCs, phones, sports, etc.
- Material possessions
- Resource consumption
- Infrastructure
- Pollution
- Etc.



The Problem

- Exponential growth in a closed system (like planet earth) is not sustainable
- Eventually you run out of resources to sustain the population



Problem Areas:

Land for agriculture
Agricultural products
Fertilizer
Fresh water
Iron ore
Steel
Lumber
Rubber
Copper
Sand for concrete
Oil & gas reserves
Plastics
Semiconductors
Etc.

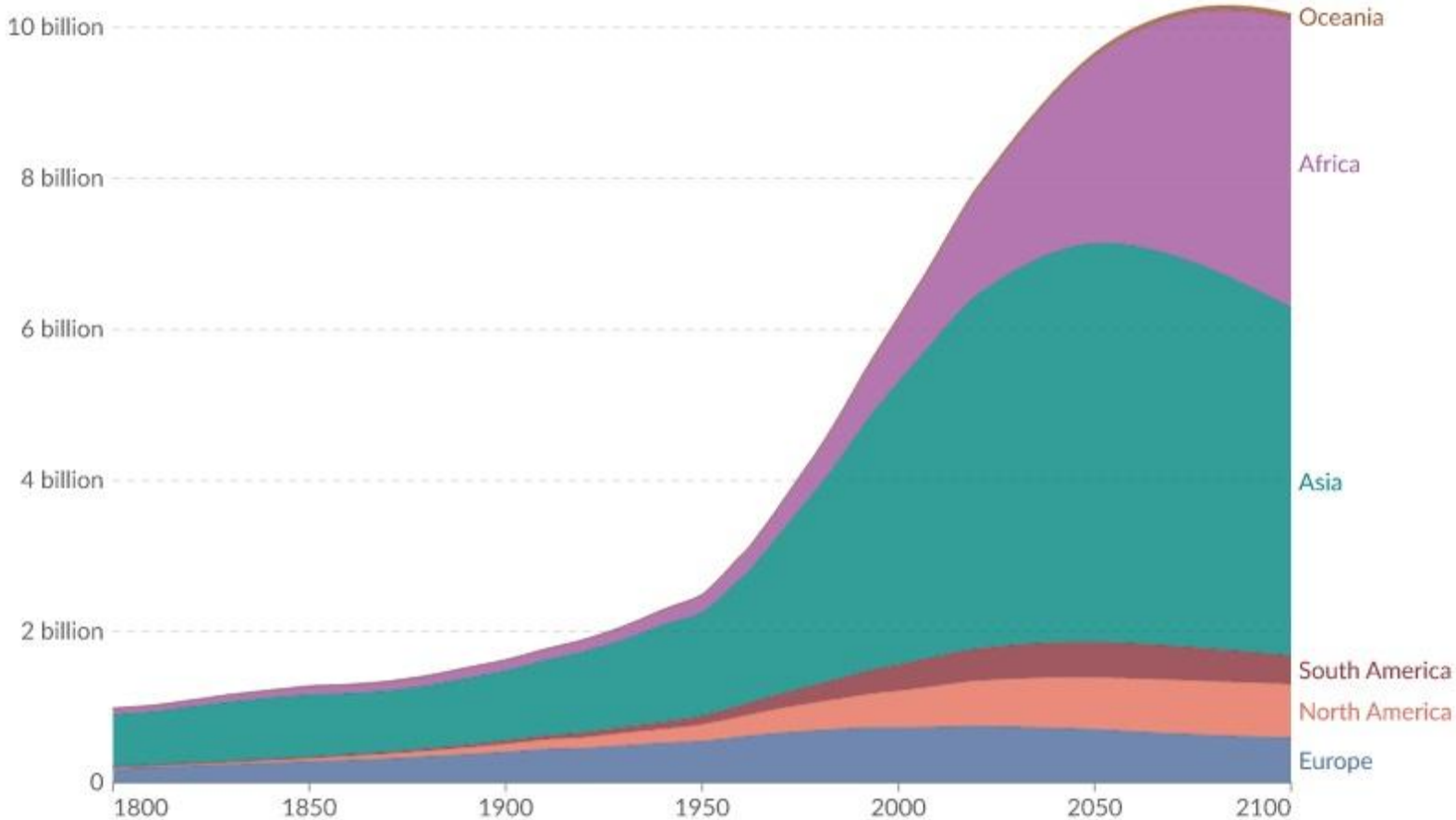
Some good news by the end of the century?

Is this
“too
little,
too
late?”

Population by world region

Historic estimates with future projections based on the UN medium scenario.

Our World
in Data



Data source: HYDE (2023); Gapminder (2022); UN WPP (2024)

OurWorldinData.org/population-growth | CC BY

Note: Historical country data is shown based on today's geographical borders.

The Downside:

If the population declines too rapidly, there will not be enough workers to support an aging population – Leading to a societal collapse

The Good and the Bad

The Good News – we may have a few decades to course correct

The Bad News – we may only have a few years to course correct

Now is the time to act!

*“We do not inherit the earth from
our ancestors; we borrow it from
our children”*

Chief Seattle