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sonke siya phambili
saam vorentoe

Food Safety and Saving Food: Packaging's contribution to food & nutrition security

Gunnar Sigge

IPSA National Packaging Conference

CTICC, Cape Town 2023

We all need to Eat!

Our Food System is seriously challenged

CaST Network

SUSTAINABLE DEVELOPMENT GOALS
1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS

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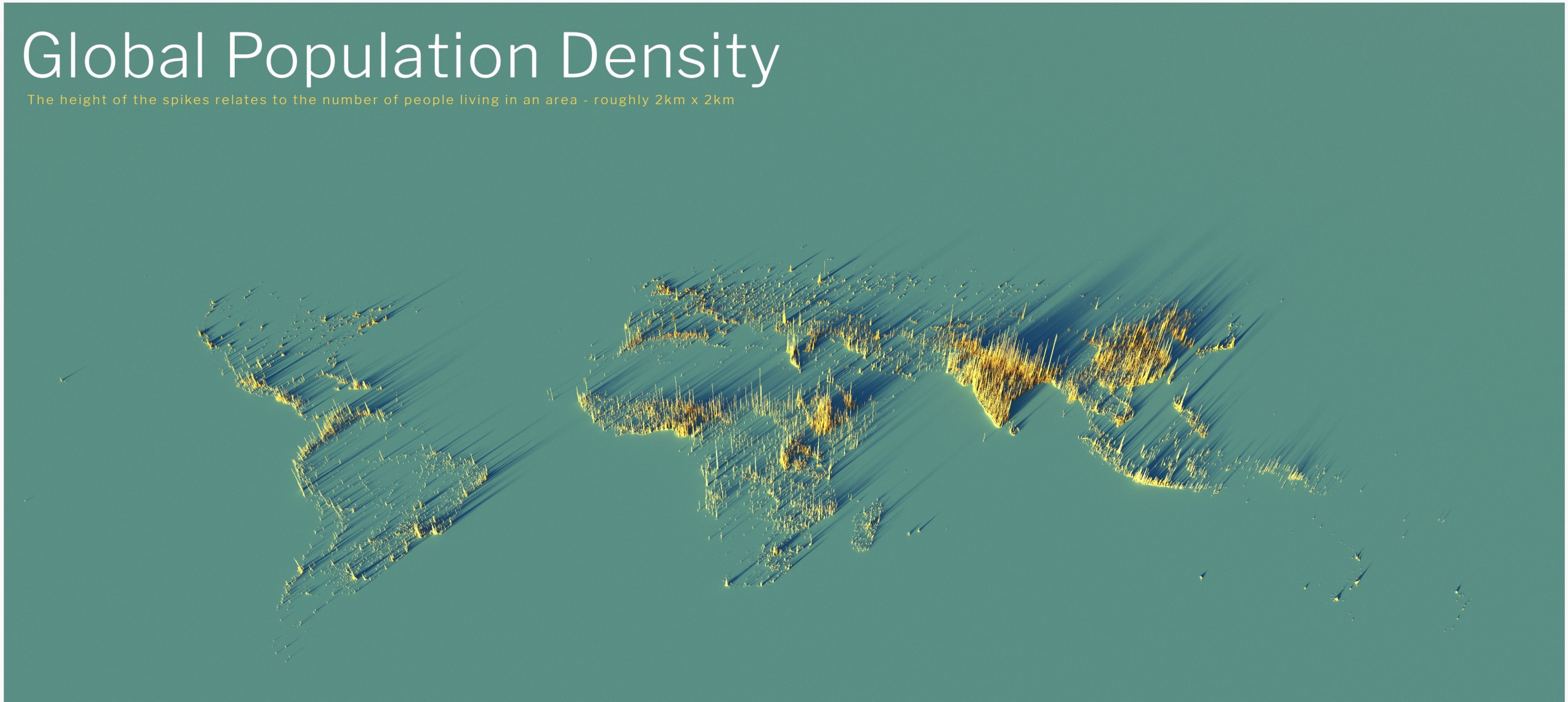
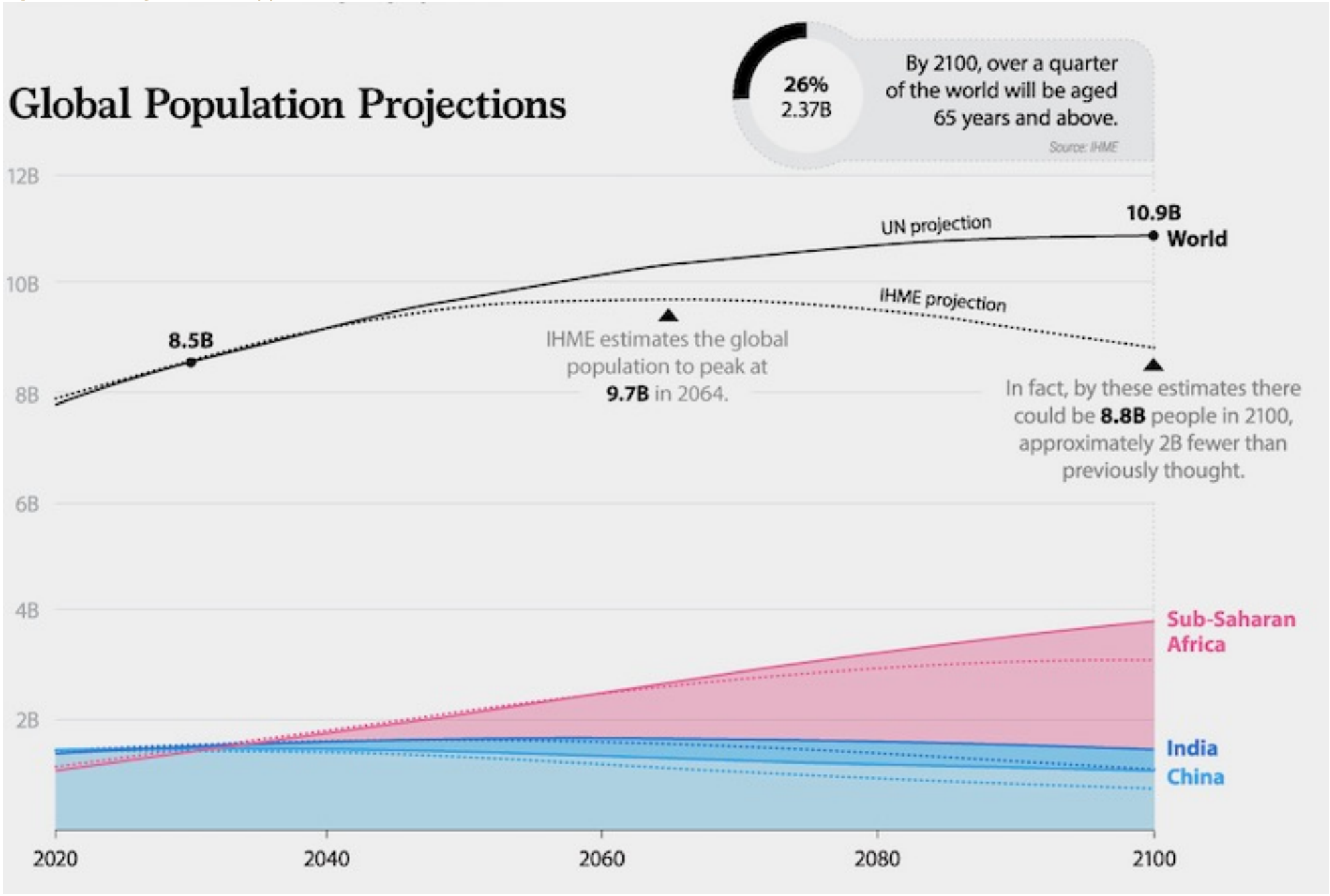
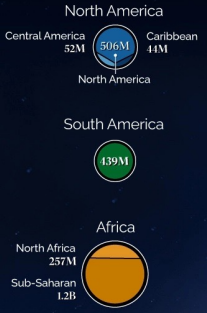
All the People

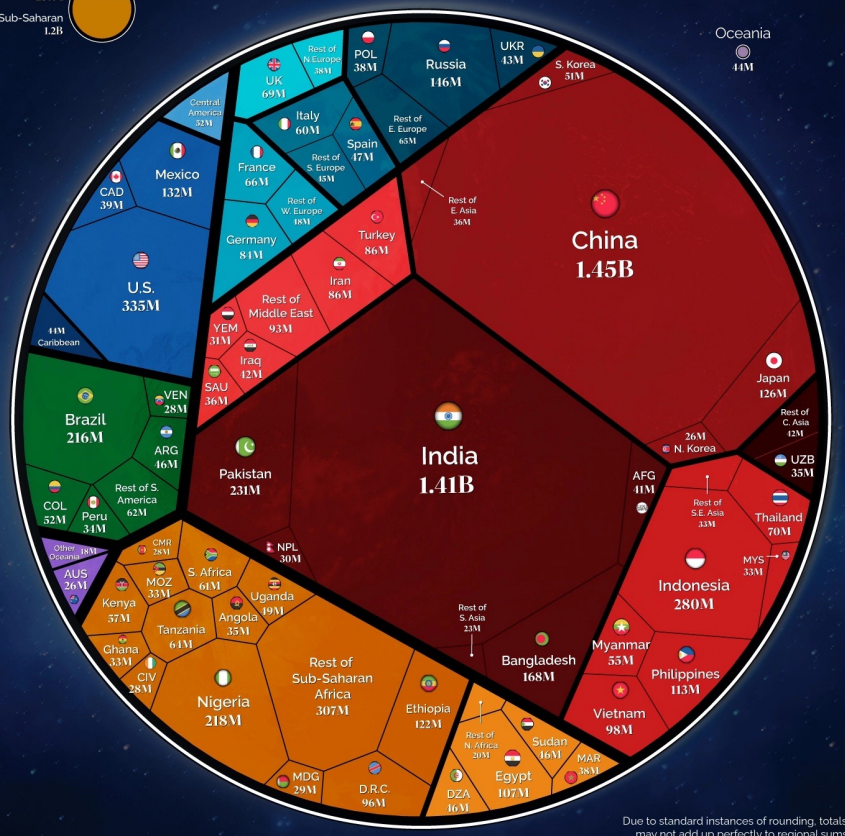



Global Population Projections
26%
2.37B
By 2100, over a quarter of the world will be aged 65 years and above.
Source: IHME
12B
10B
8B
6B
4B
2B
UN projection
IHME projection
10.9B
World
8.5B
IHME estimates the global population to peak at 9.7B in 2064.
In fact, by these estimates there could be 8.8B people in 2100, approximately 2B fewer than previously thought.
Sub-Saharan Africa
India
China
2020
2040
2060
2080
2100

World's Population at 8 BILLION PEOPLE

Around November 2022, the world will reach a pivotal milestone—8 billion global population. What is the distribution of this population, by region and country?





Due to standard instances of rounding, totals may not add up perfectly to regional sums.

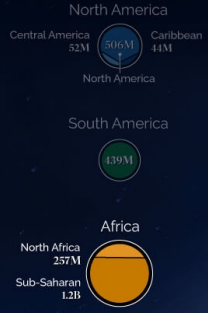
Source: UN Population Division, 2022.

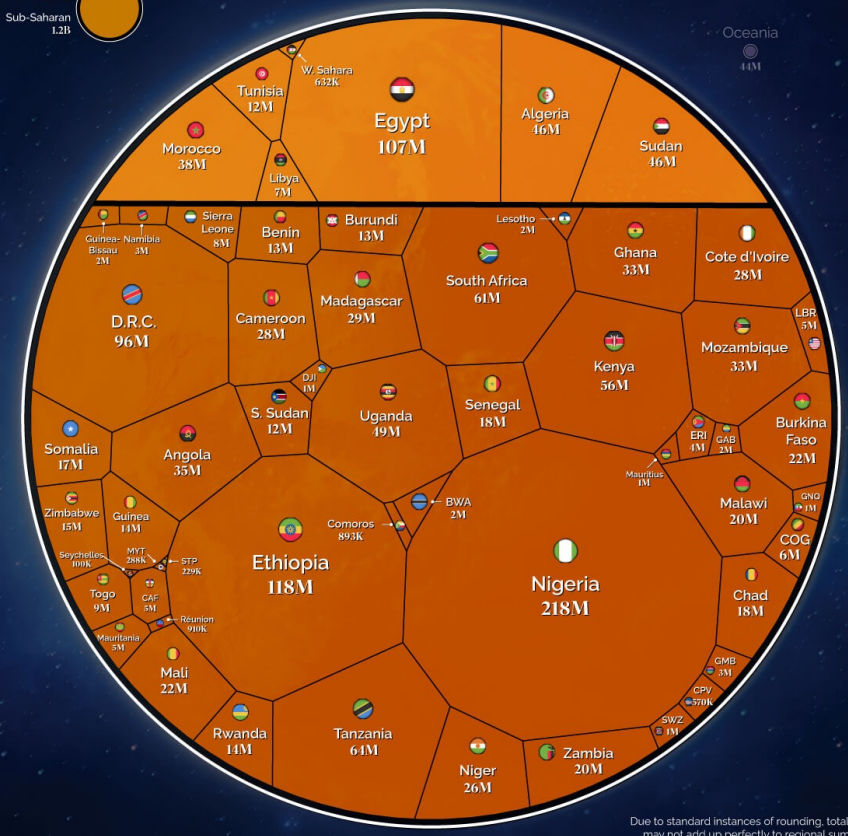
VISUAL CAPITALIST

/visualcapitalist @visualcap visualcapitalist.com

Africa's Population at 1.4 BILLION PEOPLE

Around November 2022, the world will reach a pivotal milestone—8 billion global population. What is the distribution of this population, by region and country?





Due to standard instances of rounding, totals may not add up perfectly to regional sums.

Source: UN Population Division, 2022.

VISUAL CAPITALIST

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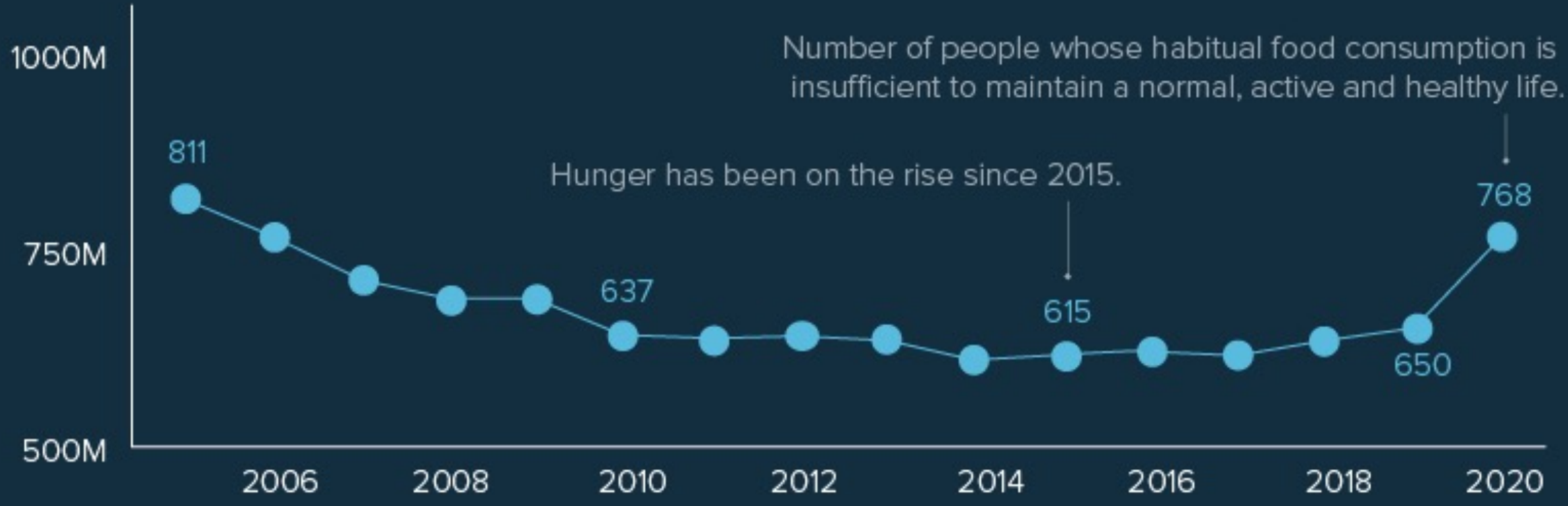
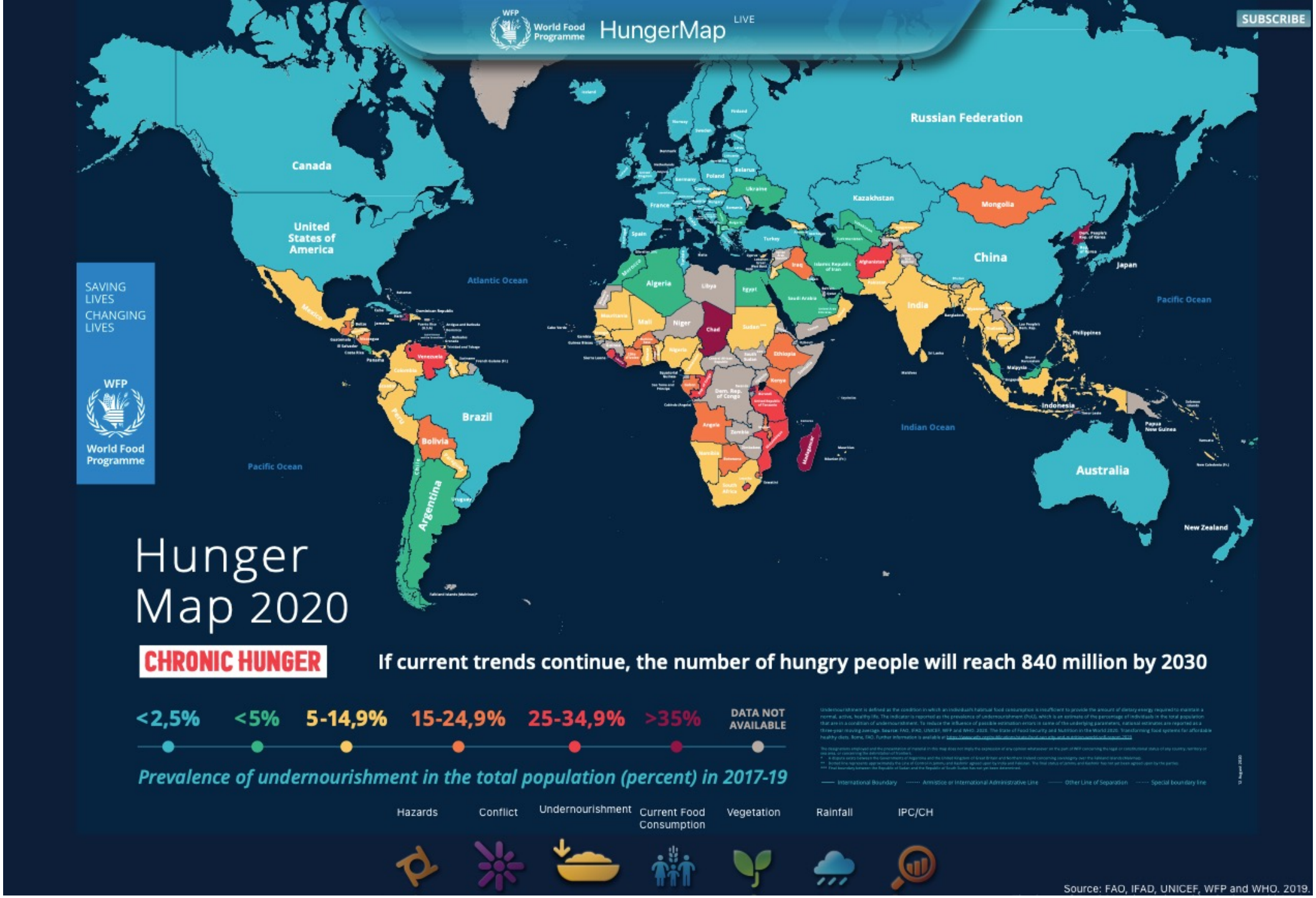
Chronically Hungry

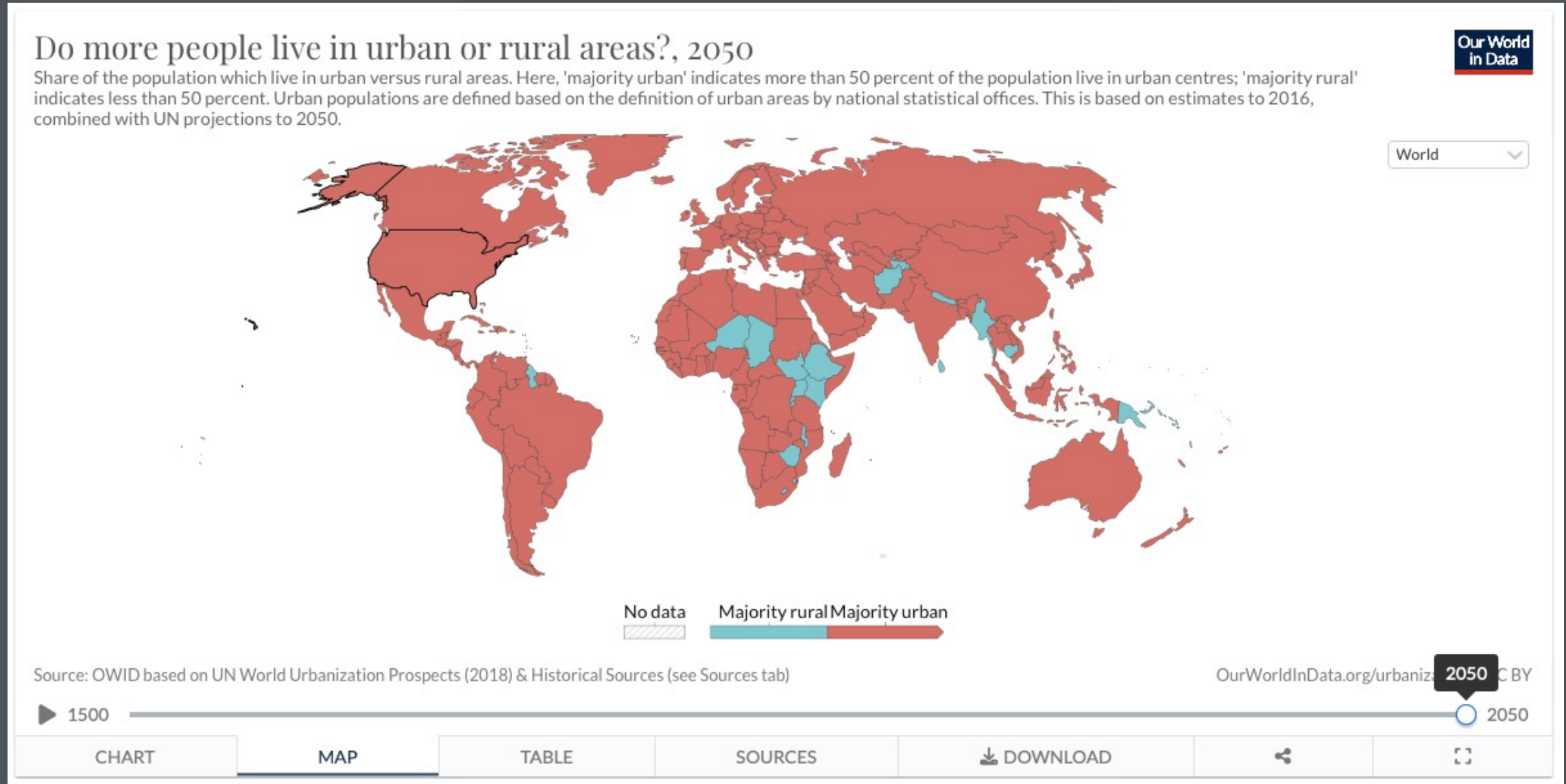
768 million people were chronically hungry in 2020.



Source: WFP


World Food Programme
HungerMap LIVE
SUBSCRIBE
SAVING LIVES
CHANGING LIVES
WFP
World Food Programme
Hunger Map 2020
CHRONIC HUNGER
If current trends continue, the number of hungry people will reach 840 million by 2030
<2,5%
<5%
5-14,9%
15-24,9%
25-34,9%
>35%
DATA NOT AVAILABLE
Prevalence of undernourishment in the total population (percent) in 2017-19
Hazards
Conflict
Undernourishment
Current Food Consumption
Vegetation
Rainfall
IPC/CH
Source: FAO, IFAD, UNICEF, WFP and WHO. 2019.
Russian Federation
Canada
United States of America
China
India
Brazil
Australia
Indonesia
Atlantic Ocean
Pacific Ocean
Indian Ocean

Urbanisation



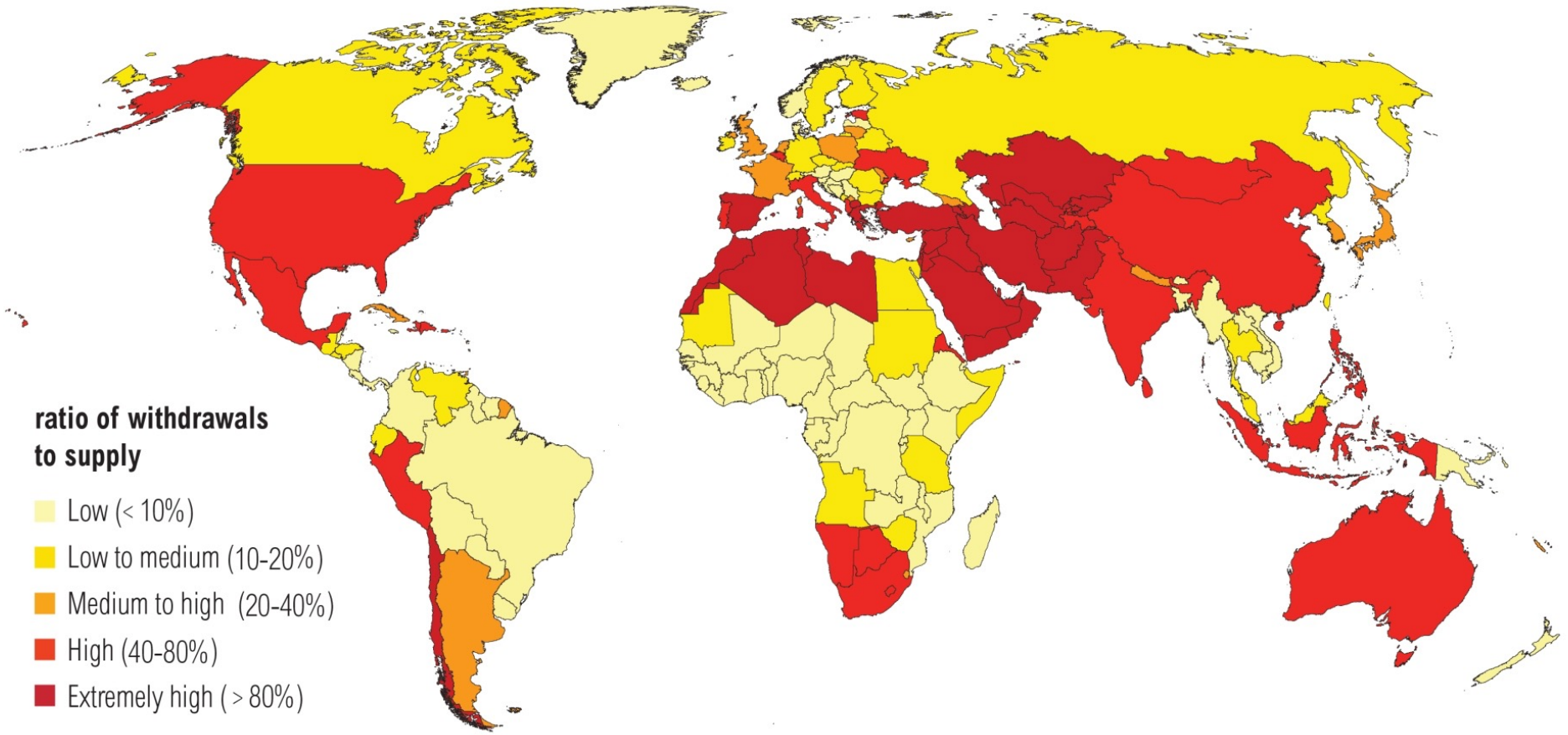
Global Warming vs. Climate Change

The gradual increase of Earth's surface temperature.

The long-term change in global weather patterns.

YOUR DICTIONARY

Water Stress by Country: 2040



NOTE: Projections are based on a business-as-usual scenario using SSP2 and RCP8.5.

For more: ow.ly/RiWop

WORLD RESOURCES INSTITUTE

FOOD LOSS AND WASTE FACTS

every year around the globe

1.3 BILLION TONNES OF

FOOD

is

lost or **wasted**

that is

1/3 **OF ALL FOOD PRODUCED FOR HUMAN CONSUMPTION**

Global quantitative food losses and waste for each commodity group per year:

30% CEREALS
In industrialized countries, consumers throw away 286 million tonnes of cereal products.

20% DAIRY PRODUCTS
In Europe alone, 29 million tonnes of dairy products are lost or wasted every year.

35% FISH AND SEAFOOD
8% of fish caught globally is thrown back into the sea. In most cases they are dead, dying or badly damaged.

45% FRUITS AND VEGETABLES
Almost half of all the fruit and vegetables produced are wasted.

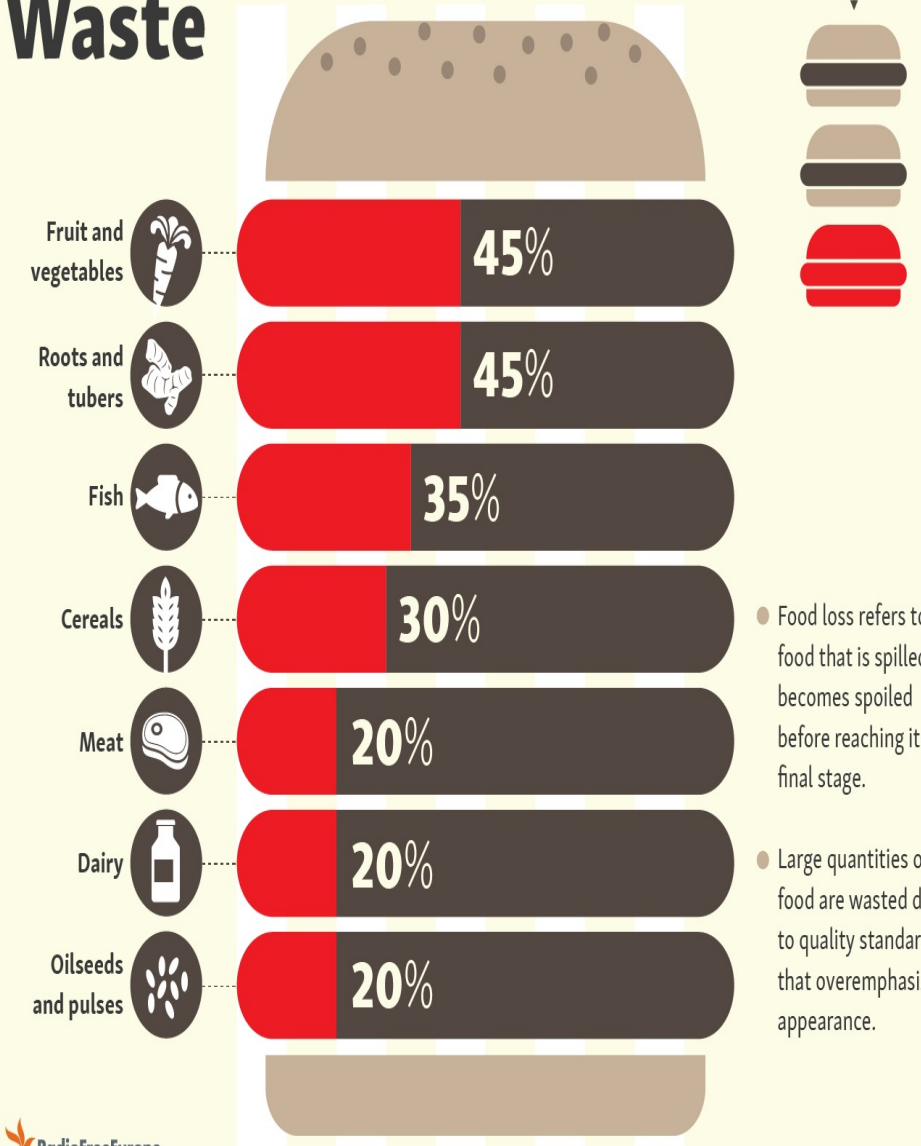
20% MEAT
Of the 263 million tonnes of meat produced globally, over 20% is lost or wasted.

20% OILSEEDS AND PULSES
Every year, 22% of the global production of oilseeds and pulses is lost or wasted.

45% ROOTS AND TUBERS
In North America & Oceania alone, 5 814 000 tonnes of roots and tubers are wasted at the consumption stage alone.

Global Food Waste

Approximately 1.3 billion tons of food is lost or wasted every year. That is about **one-third** of all the food produced for human consumption in the world.



- Food loss refers to food that is spilled or becomes spoiled before reaching its final stage.
- Large quantities of food are wasted due to quality standards that overemphasize appearance.

RadioFreeEurope RadioLiberty

C. Coelho | Source: FAO

FOOD LOSS AND WASTE FACTS

every year around the globe

1.3 BILLION TONNES OF

FOOD

is

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that is

1/3 **OF ALL FOOD PRODUCED FOR HUMAN CONSUMPTION**

Food loss and waste also amount to a major squandering of resources, including:

water | land | energy | labour and capital

and needlessly produce GREENHOUSE GAS EMISSIONS, contributing to GLOBAL WARMING and CLIMATE CHANGE.

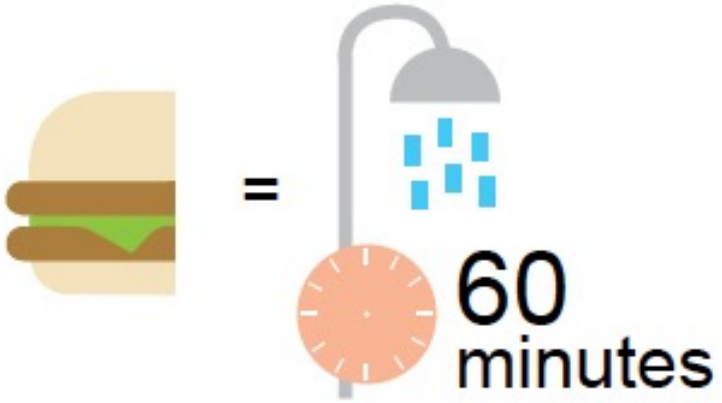
www.fao.org/save-food

SAVE FOOD: Global Initiative on Food Loss and Waste Reduction

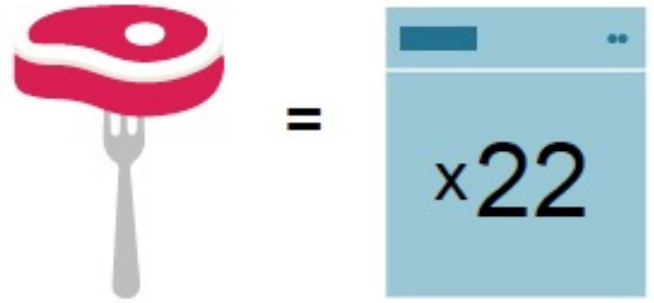
Food and Agriculture Organization of the United Nations

©FAO, 2015

Food Loss & Waste – Water Resources



Throwing away half your hamburger is equal to a 60-minute shower with a water-efficient shower head

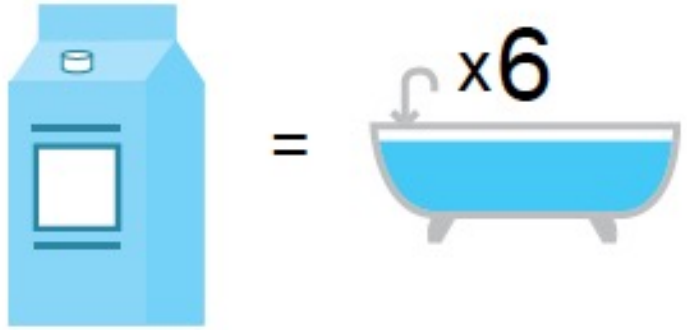


Leaving a mouthful of steak on your plate equates to running your dishwasher 22 times

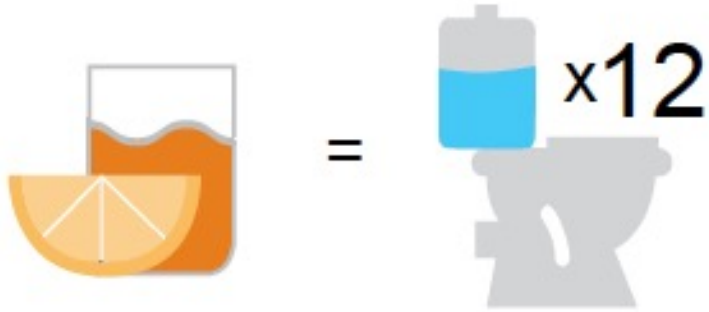
Spilling a teaspoonful of sugar equates to about one flush of a dual-flush toilet

Wasting just one teaspoon of milk is equivalent to one flush of a dual-flush toilet

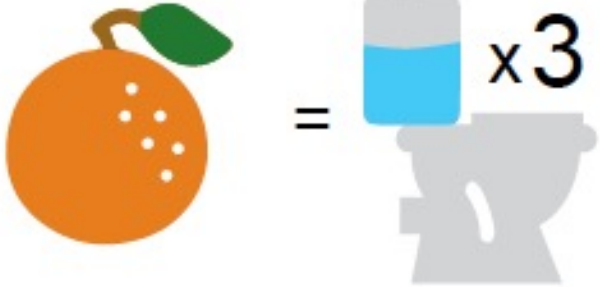
Food Loss & Waste – Water Resources



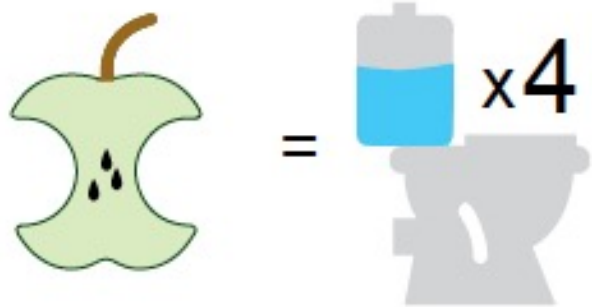
Wasting a litre of milk is equivalent to taking six full baths



Pouring half a cup of orange juice away is equal to flushing the toilet 12 times



Letting a clementine rot is equivalent to flushing the toilet three times



Letting an apple or pear rot is equivalent to taking a 3-minute shower (or flushing the toilet four times)

Food loss/waste occurs throughout the food value chain

Tetra Pak solutions focus on processing and packaging

~ food wasted globally

Supply chain — 27%

Farming and growing — 10%
- Inadequate harvesting time
- Climatic conditions
- Practices applied at harvest and handling
- Challenges in marketing produce

Handling and storage — 5%
- Damaged products
- Poor forecasting
- Inefficient factory processes

Processing and packaging — 12%
- Food degraded by pests, fungus and disease

Distribution and retail — 27%
- Damaged goods
- Expiration date
- Aesthetic standards

Consumption — 46%

Households — 34%
- Overstocking
- Date label confusion
- Prepared too much

Foodservice — 12%
- Excessive portion sizes
- Kitchen losses

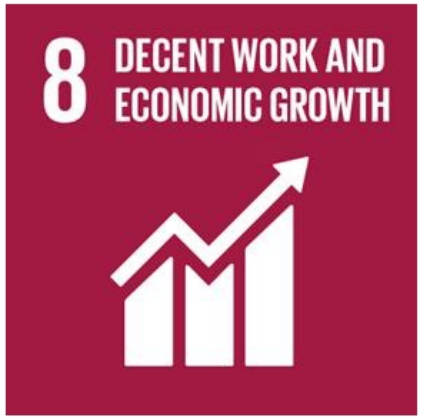
Source: FAO data '00-'17 median, WRI, Bain analysis

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

A TRIPLE WIN

By reducing food loss and waste by 50% by 2030 (SDG 12.3) we can help

TACKLE CLIMATE CHANGE



BOOST ECONOMIES

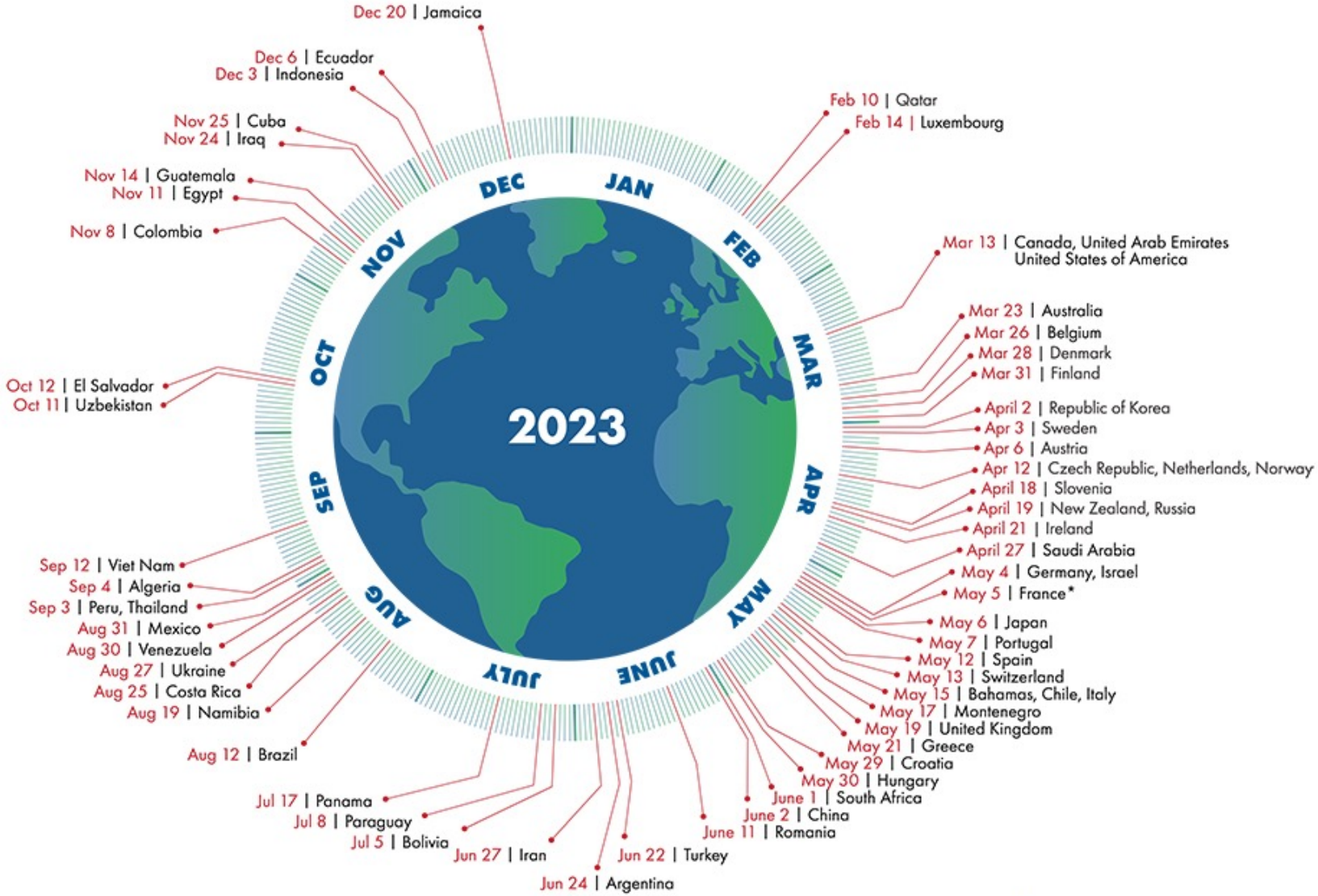
PROMOTE FOOD SECURITY

If food loss & waste were a country, it would be the 3rd biggest source of greenhouse gas emissions.

eufic

Country Overshoot Days 2023

When would Earth Overshoot Day land if the world's population lived like...



For a full list of countries, visit overshootday.org/country-overshoot-days.
*French Overshoot Day based on nowcasted data. See overshootday.org/france.

Source: National Footprint and Biocapacity Accounts, 2022 Edition
data.footprintnetwork.org

EARTH OVERSHOOT DAY

Global Footprint Network
Advancing the Science of Sustainability

HOW SAFE IS YOUR FOOD?

From farm to plate,
make food safe

Every year, **food poisoning** causes:

600,000,000
illnesses

420,000
deaths

125,000
deaths among children under 5

These **diarrheal diseases** are the top causes of deaths and illnesses:

Norovirus

Campylobacter

Salmonella

E. coli

SOURCE: World Health Organization

TECH INSIDER

IN SUMMARY

Our Food System is severely challenged:

- Produce more crops sustainably with less water, less inorganic fertilizers, less pesticides, higher nutrient contents, higher yields
- But yet, be more accessible, more affordable, more palatable and **safer**
- While also reducing **food loss and waste**
- And, endure climate change and more risk as a result of extreme weather conditions

- Therefore, we have to convert “excess” raw agricultural produce into edible, healthy, nutritious and SAFE food products to SAVE food

How do we do this?

Extend shelf-life of fresh produce

Extend shelf-life by processing

Fresh Produce Shelf-life Extension

Strawberries at 20 °C

Hour 0

after 18 hours

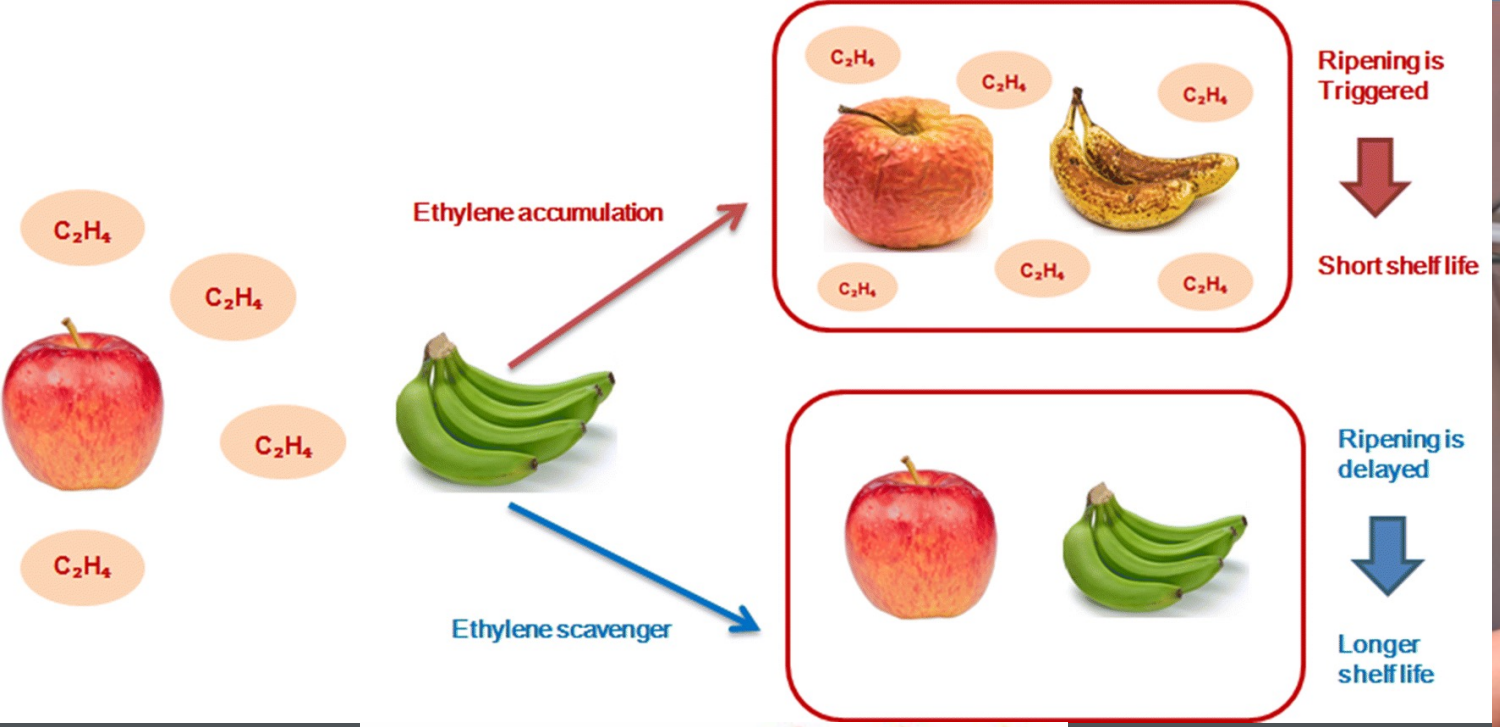
after 36 hours

Snap-on lid package

- Not EMAP packaging
- Air in the package
- Faster spoiling

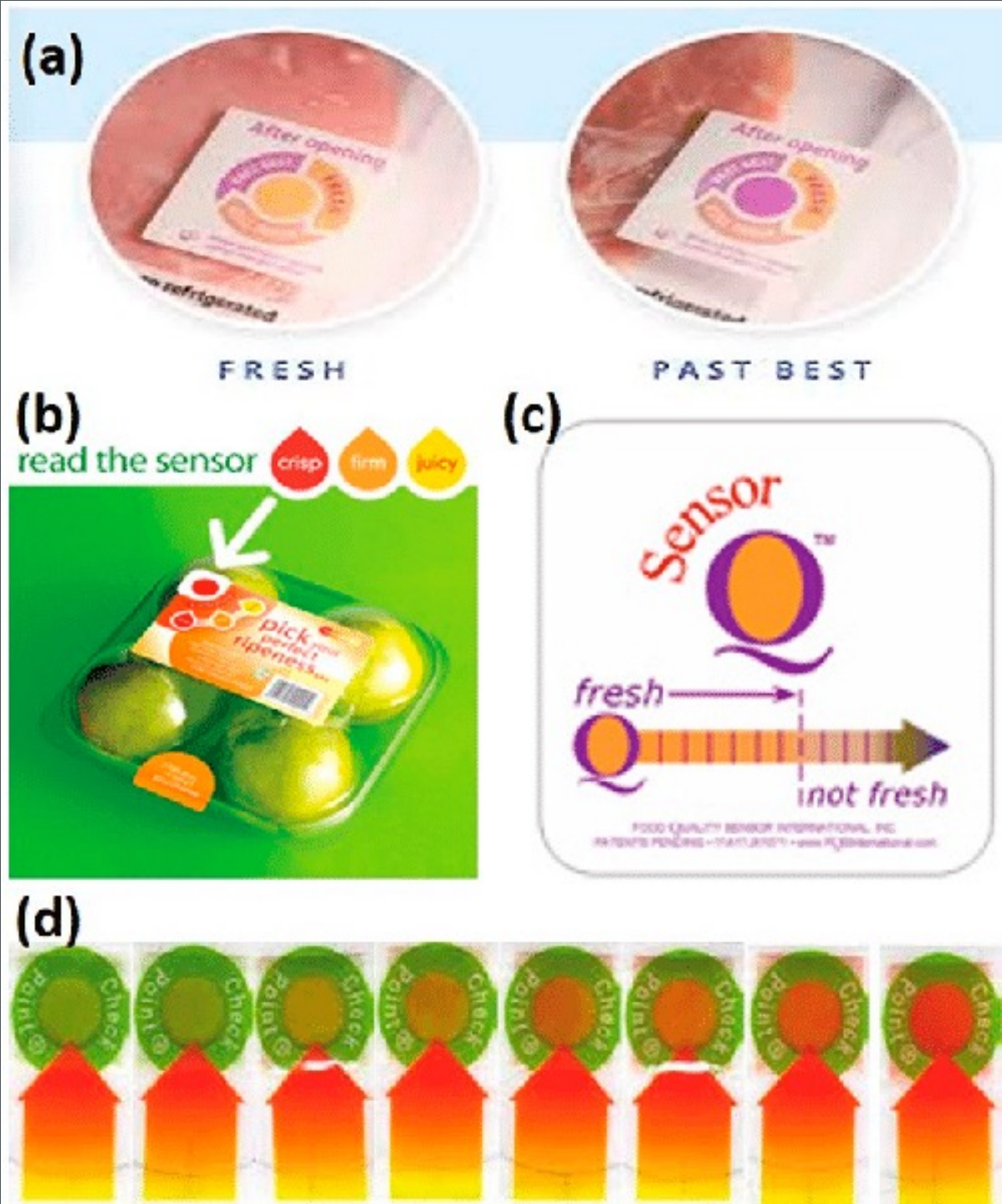
freshsafe

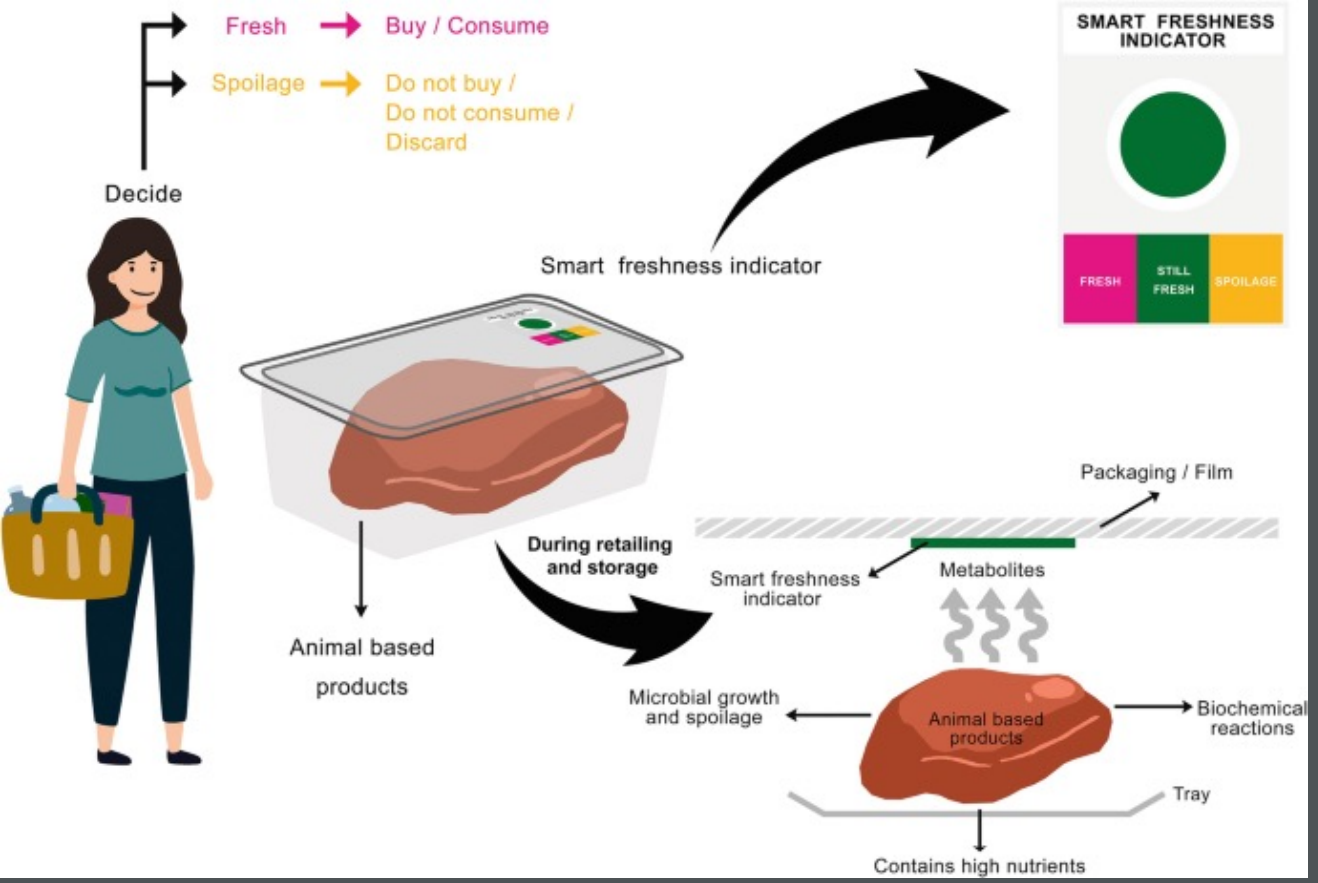
- Passive EMAP packaging
- Optimum adjustment of CO_2 and O_2 in the package
- Extended shelf life


C_2H_4
C_2H_4
C_2H_4
C_2H_4
Ethylene accumulation
C_2H_4
C_2H_4
C_2H_4
C_2H_4
C_2H_4
C_2H_4
Ripening is Triggered
Short shelf life
Ethylene scavenger
Ripening is delayed
Longer shelf life

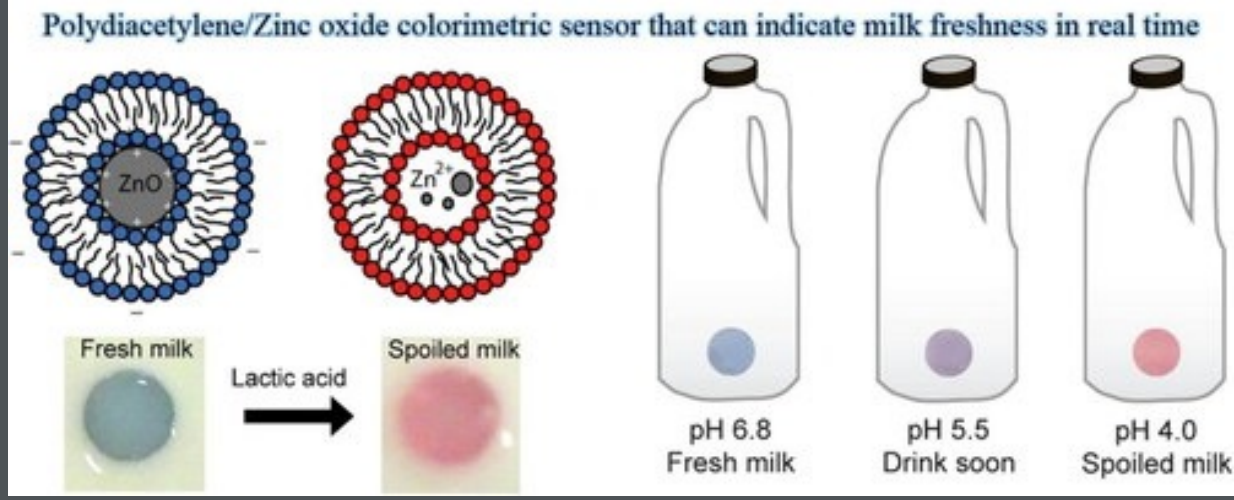
read the sensor
crisp
firm
juicy
pick your perfect ripeness...

slices
PAST BEST
JUST OPENED
USE SOON


(a)
After opening
FRESH
After opening
PAST BEST
(b)
read the sensor
crisp
firm
juicy
(c)
Sensor Q™
fresh
not fresh
(d)


Fresh
Buy / Consume
Spoilage
Do not buy /
Do not consume /
Discard
Decide
Smart freshness indicator
SMART FRESHNESS INDICATOR
FRESH
STILL FRESH
SPOILAGE
Packaging / Film
During retailing and storage
Smart freshness indicator
Metabolites
Animal based products
Microbial growth and spoilage
Animal based products
Biochemical reactions
Tray
Contains high nutrients

Smart freshness packages: milk boxes change their color with nearing expiry


Polydiacetylene/Zinc oxide colorimetric sensor that can indicate milk freshness in real time
ZnO
Zn^{2+}
Fresh milk
Lactic acid
Spoiled milk
pH 6.8
Fresh milk
pH 5.5
Drink soon
pH 4.0
Spoiled milk

Flexible Packaging Extends Shelf Life (in days)

Flexible Packaging Reduces Food Waste

Zucchini, 1 → 5

Green Beans, 7 → 19

Banana, 15 → 36

Table Grape, 7 → 70

Cherries, 14 → 28

Pear, 7 → 15

Broccoli Florets, 6 → 20

Bell Pepper, 4 → 20

Mango, 20 → 40

Ground Beef, 3 → 20

Beef, 14 → 23

Whole Chicken, 7 → 20

Fresh Sliced Turkey, 14 → 21

Lamb Steaks, 8 → 13

Provolone Cheese, 190 → 280

Fresh Swordfish, 7 → 12

Source: FPA *Value of Flexible Packaging in Extending Shelf Life and Reducing Food Waste Report*

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Food Processing Shelf-life Extension

How do we do this?

- Treatment followed by aseptic packaging

- Packaging followed by treatment in-package

Food Processing Shelf-life Extension

How do we do this?

Processing Technologies

Thermal

- Pasteurisation
- Canning & Retorting
- Drying
- Distilling
- Baking & roasting
- Extrusion

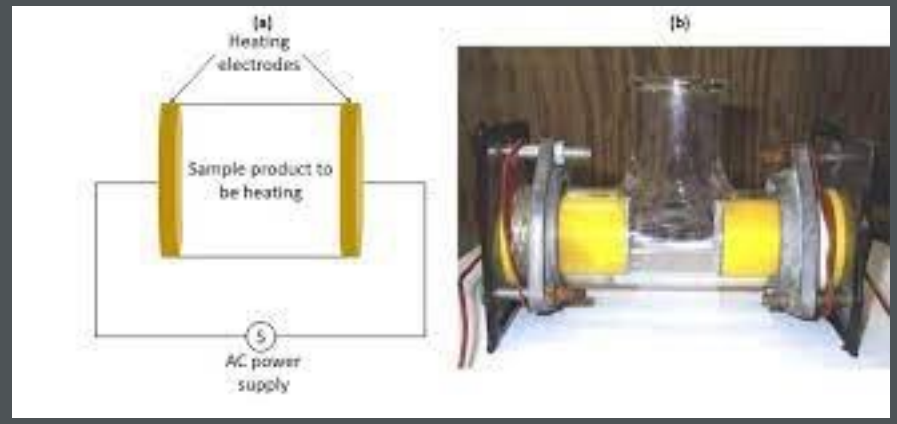
Non-thermal

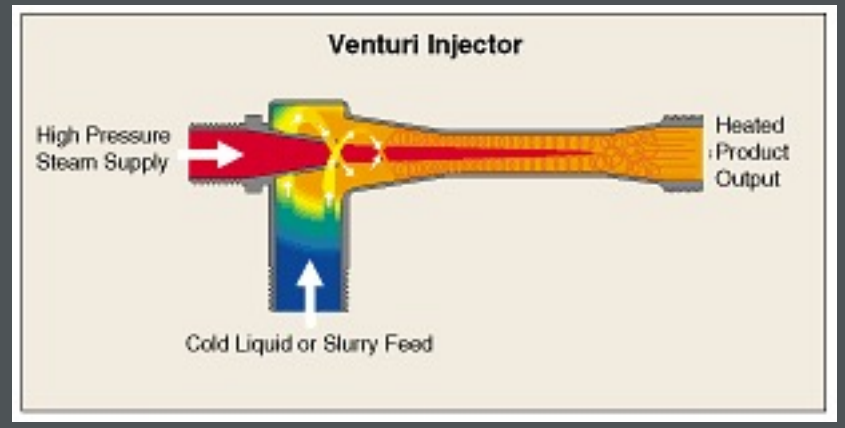
- Chilling
- Freezing
- Freeze-drying

Novel Processing Technologies

Thermal

- Microwave
- Radio Frequency
- Ohmic Heating
- Direct Steam Injection





Novel Processing Technologies

Non-thermal

- HPP
- PEF
- UV
- Ultrasonics
- Irradiation
- Light based technologies
- Cold Plasma
- Ozonation
- Dense-phase CO_2

Novel Processing Technologies

Non-thermal

- HPP
- PEF
- UV
- Ultrasonics
- Irradiation
- Light based technologies
- Cold Plasma
- Ozonation
- Dense-phase CO_2

enabled production of shelf-stable foods with retention of nutrients, flavours, colours, lowered energy and water requirements, reduced waste generation, and reduced requirements of chemicial processing aids

THE ORIGINAL
ALL GOLD
TOMATO SAUCE
ALL GOLD
TAMATIE SOUS

once upon a farm
tío
ZÜPA
QUESO
Guacamole
NANA
Homegrown
suja elements
GINGER LIMEADE
ALBÓNDIGAS EN SALSA
TAPAS al minuto
CHORICITOS picantes

McCain
Stir Fry
McCain
Garden Peas
McCain
Country Crop
McCain
CRISPY
Oven Chips
McCain

yokos
PLAIN
CULTURED
ALMOND
DAIRY FREE
NEW
UNSWEETENED 1kg

JanBraai
POTJIE SAUCE
JanBraai
POTJIE SAUCE
JanBraai
POTJIE SAUCE

Barilla
ROTINI
Betty Crocker
Lemon Poppy Seed
Contadina
DICED

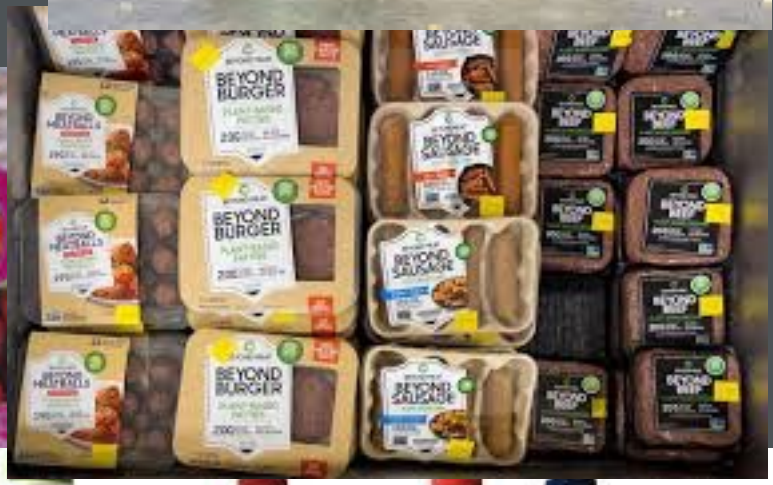
PRÉSIDENT
PRÉSIDENT

Lay's
Barbecue
Flavored
Lay's
Honey
Barbecue
Lay's
Flamin' Hot

Jungle
Oats

Grapetiser
Appletiser
100%
APPLE JUICE
Peartiser

EET-SUM-MOR
SHORTBREAD BISCUITS


BEYOND
BURGER

THE BRM BEEF BOX
BRM
BEEF
RIBS

ProNutro
OUMA
BUTTERMILK
FUTURELIFE
TASTIC

RICE
ALMOND

Shelf-life Extension

Packaging is the Game-changer

Packaging

Basic Functions and Features of Packaging

- Contains
- Protects
- Preserves
- Enables portion sizes
- Communicates - Educates/informs
- Transports
- Merchandises, motivates sales,
- Environmentally and economically sustainable

The Way Forward

The Role of Packaging & Food Science

- We can’t feed the world sustainably without Food Science & Packaging
- Food Science & Packaging is the critical link in the food system – the link between primary production and consumption
- Ensuring safety, shelf-life extension and preservation of nutrients.
- More collaboration.

Stellenbosch
UNIVERSITY
IYUNIVESITHI
UNIVERSITEIT

forward together
sonke siya phambili
saam vorentoe

Thank You

Contact Details

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Tel: +27 21 808 3578