CIRPS
CENTRO INTERUNIVERSITARIO
DI RICERCA PER LO SVILUPPO SOSTENIBILE

EUREKA
Groupement d'Intérêt Économique

MUNICIPAL WASTE - INTEGRATED MANAGEMENT

Section 1 – Introduction to Waste Management and Sustainability

- **Lesson 1.1 - Presentation of the course**
- **Lesson 1.2 - Presentation of the course**
- **Lesson 1.3 - Sustainability: the three pillars (environment, society, economy) are … four (training)**
- **Lesson 1.4 - How does waste management relate to sustainability**

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Welcome to the pre-bachelor course on

MUNICIPAL WASTE – INTEGRATED MANAGEMENT

We'll spend 40 hours together in order to get some keys to discover the world of waste, with which all of us have a daily contact.

THIS IS THE LESSON ONE

Nature does not produce waste

Nature regenerates itself

The dung beetle pushes a ball of dung: its action accelerates the decomposition of excrements and facilitates the passage of nutrients such as nitrogen, phosphorus, potassium, into the soils making them more fertile. Furthermore, this movement of accumulation and rolling of dung makes it possible to move numerous seeds within the soil, making it more porous and permeable. Finally, the continuous moving of the dung facilitates the aeration of the soils and reduces the emissions of greenhouse gases such as methane, of which cattle dung is rich.

Waste are an invention of the human species

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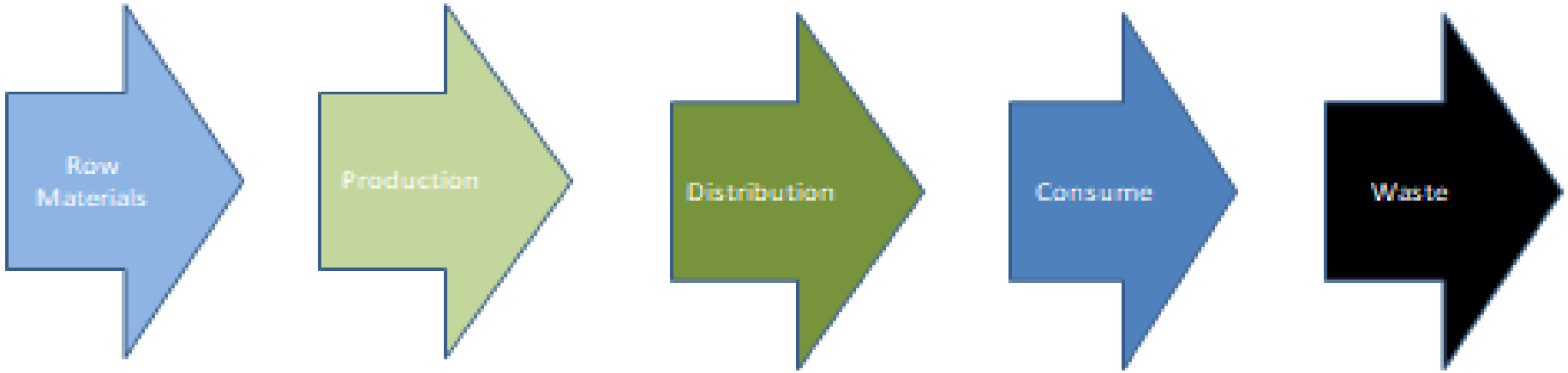
Figure 1. Waste classification by origin. Different activities generate different types of waste.

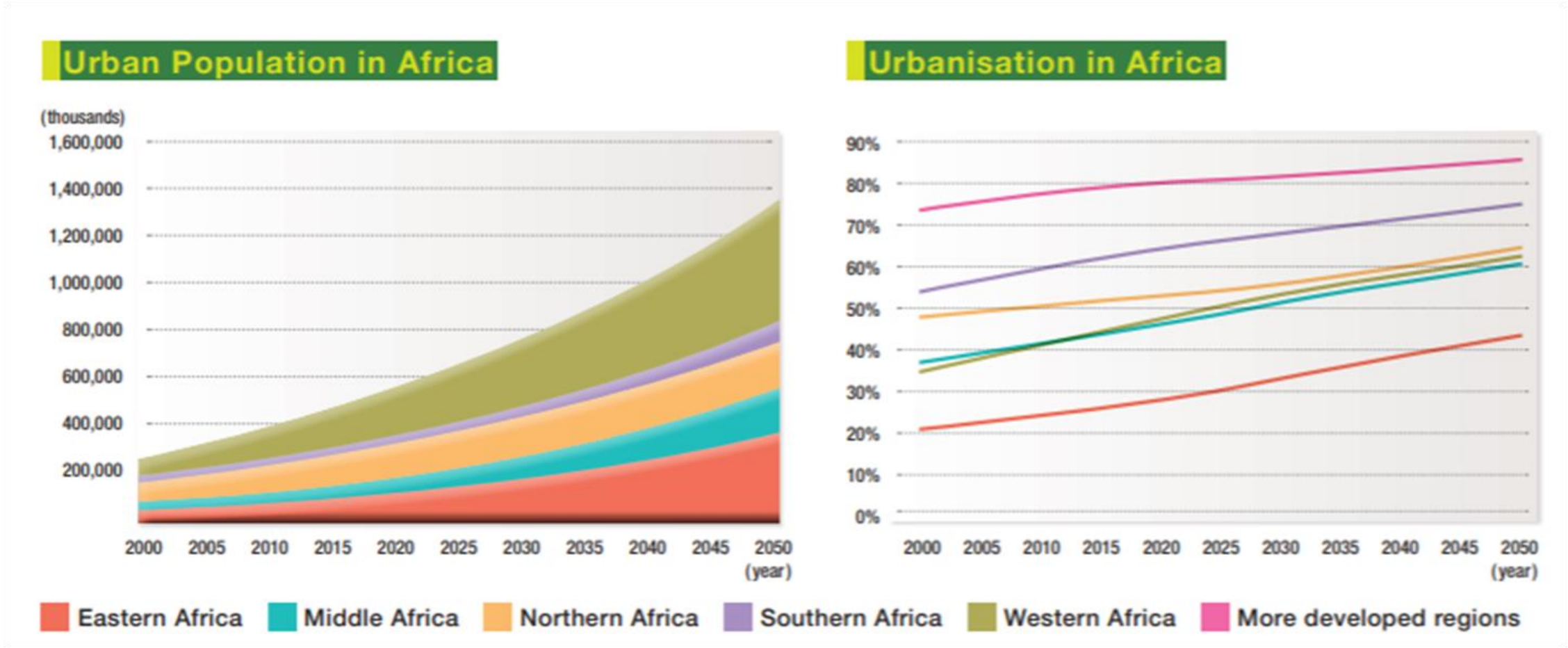
Source: National Audit Office of Estonia

Linear economy

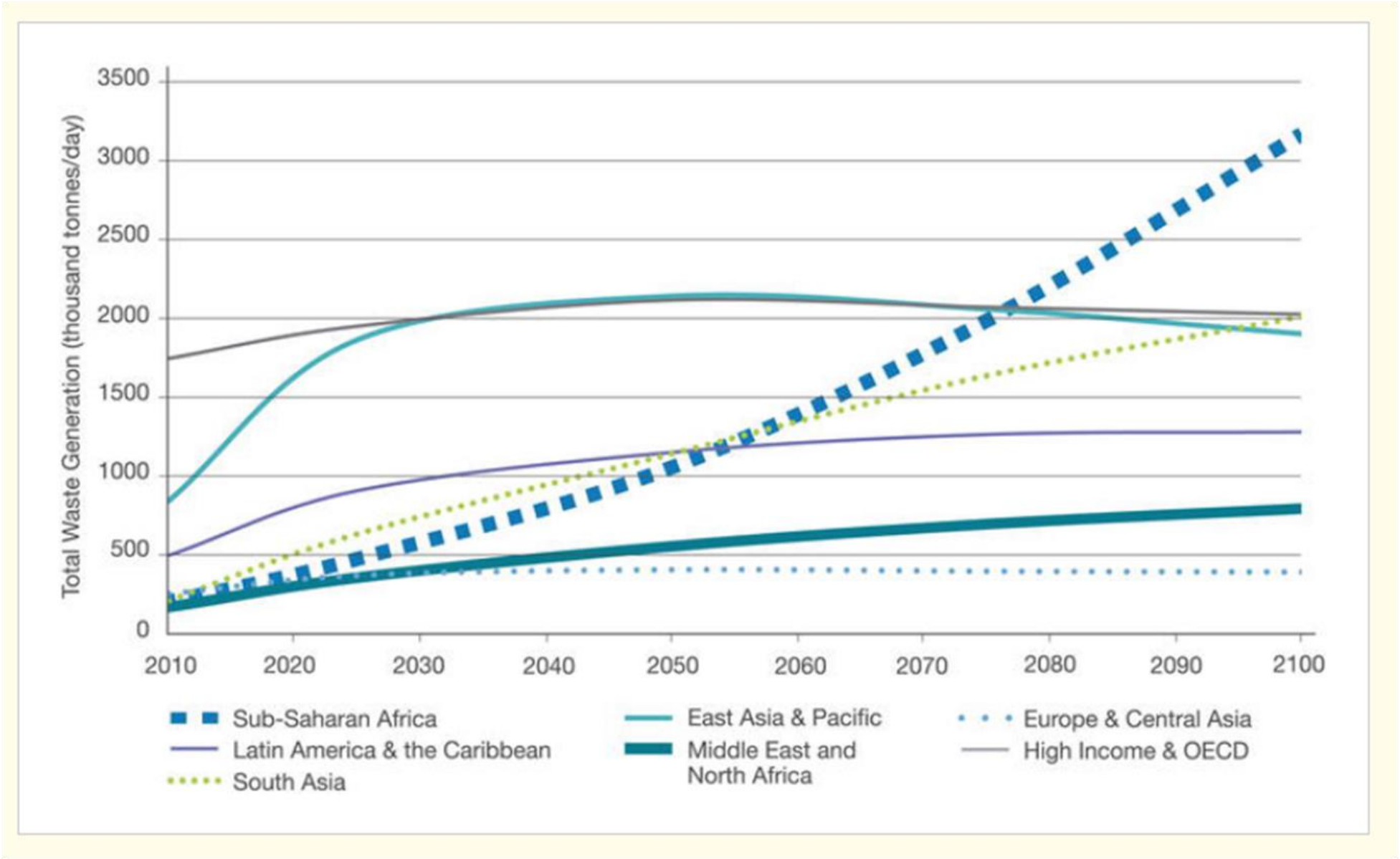


Environment: we take raw materials from it, we return waste to it

Population grows …



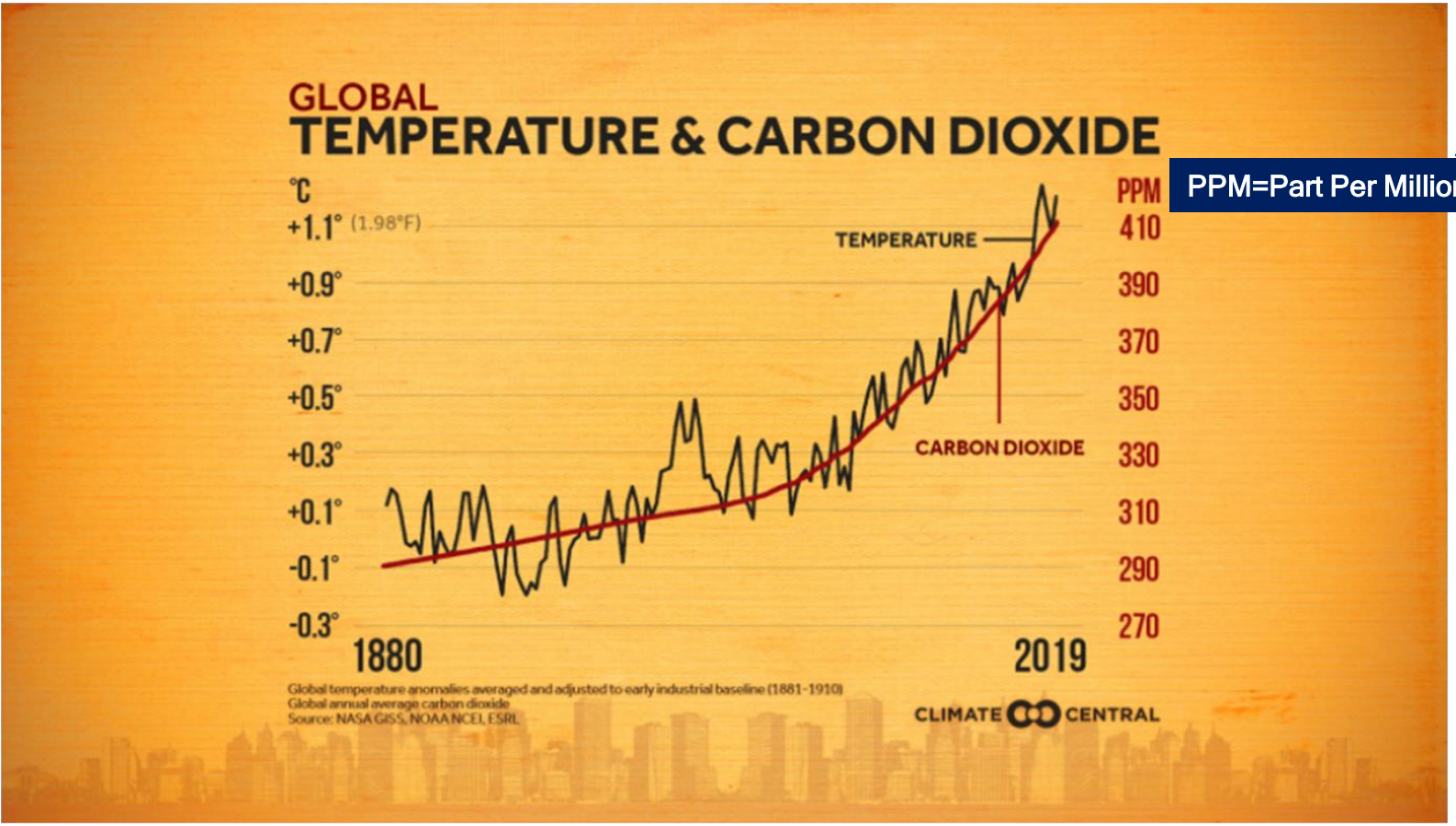
… waste production too



There are three types of waste:
solid, liquid, gaseous.

All types of pollution are produced by waste

- Gaseous waste is responsible for climate change



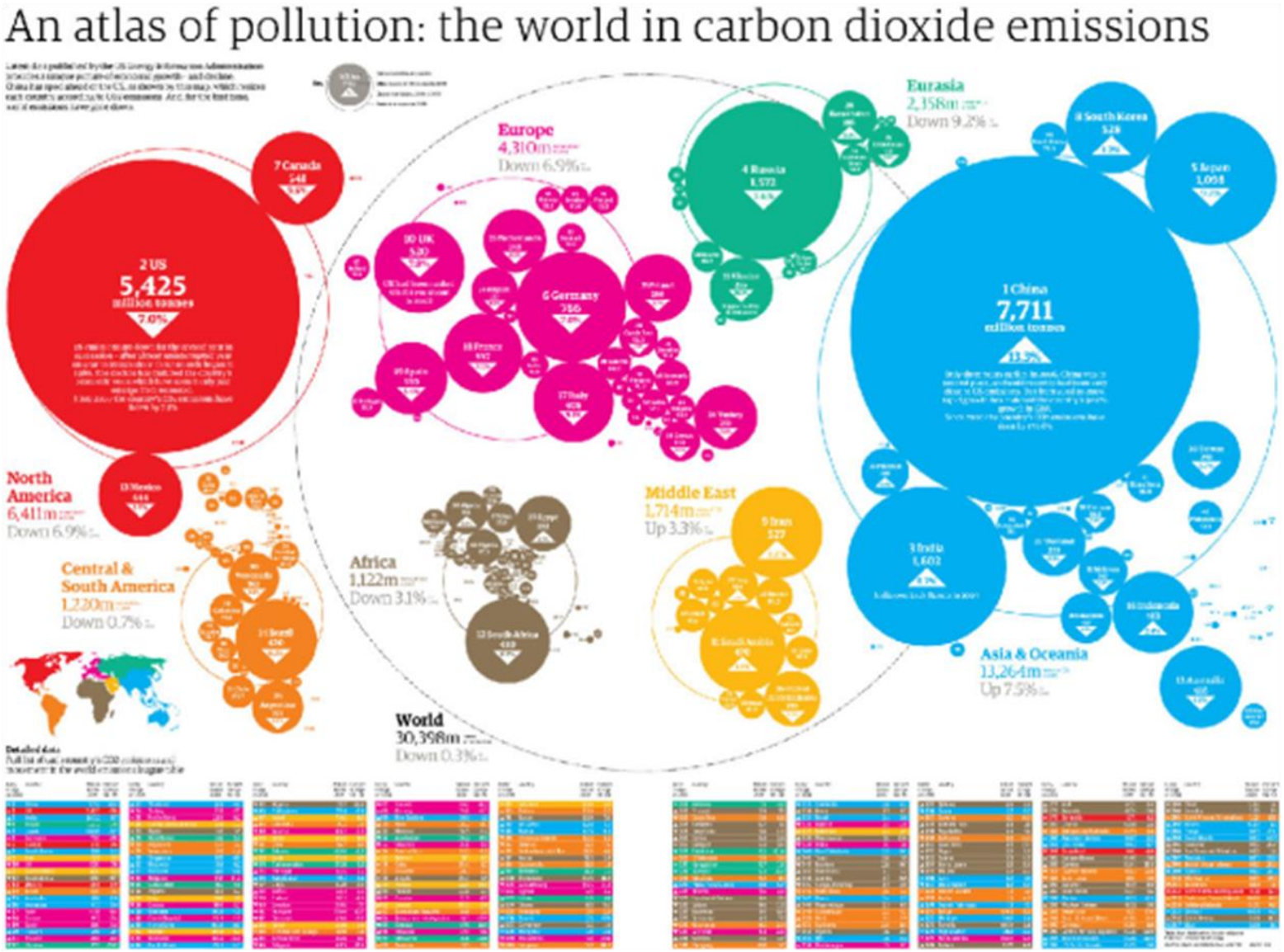
PPM=Part Per Million

It means that if we took 1 million of particles from the atmosphere, 400 would be made up of carbon dioxide. CO_2, like a one-way filter, lets the sun's energy though, but absorb the radiations emitted by the Earth, thus creating a sort of atmospheric greenhouse around the planet. Under normal conditions, this gas plays a very useful role: if it were not present in the atmosphere, indeed, the earth's average temperature would be many degrees lower than today, making our life impossible. But today the accumulation of carbon dioxide is such as to imprison excessive quantities of heat and to transform the Earth into a gigantic greenhouse.

The value 419.13 PPM is exactly 50% higher than the preindustrial ones, at the end of 18th century, when 278 PPM were present in the air.

In the last 30 years there has been the same increase seen in the previous 200.

Gaseous waste is responsible for climate change



Liquid waste poisons soil and seas

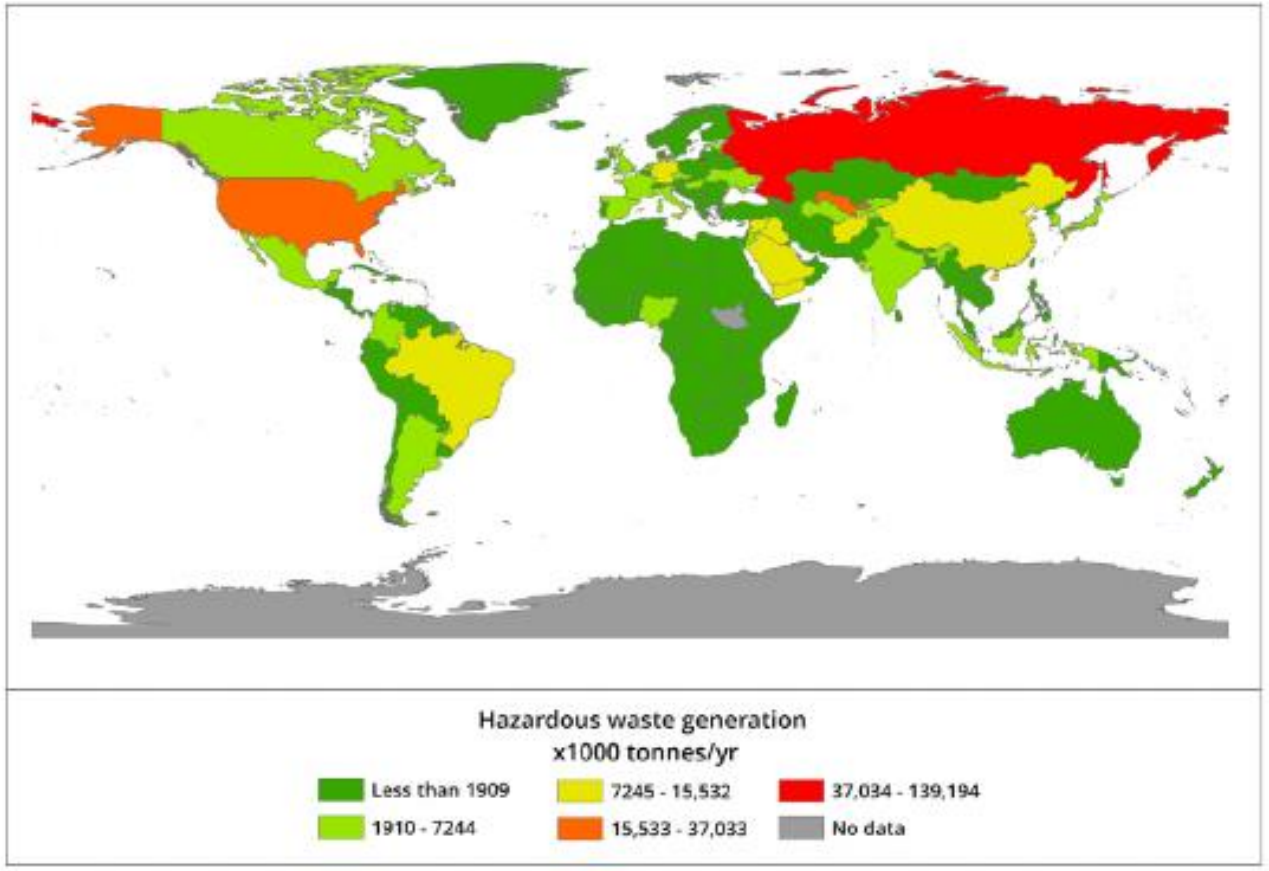


Figure 1. Hazardous Waste Generation. Source: [13].

Victor Elijah Akpan, David O. Olukanni: *Hazardous Waste Management: An African Overview*, Researchgate, July 2020

Liquid waste poisons soil and seas

Table 1. Hazardous Waste by Country. Source: [13,14].

African Countries	x1000 tons/yr	kg/Person/yr	Others (Selected Randomly)	X1000 tons/yr	kg/Person/yr
Algeria	185	6	China	9520	7
Angola	270	20	Indonesia	3143	14
Benin	428	65	India	7244	7
Botswana	37	20	Lebanon	2217	616
Burkina Faso	257	20	Malaysia	420	18
Burundi	135	20	Russia	139,194	966
Cameroon	321	20	United Kingdom	5568	94
Cape Verde	10	20	Germany	15,532	188
Central Africa Republic	78	20	Estonia	6206	4774
Chad	170	20	Denmark	374	69
Comoros	14	20	Australia	649	33
Congo	74	20	New Zealand	55	14
Cote d'Ivoire	335	20	Singapore	204	49
Democratic Republic of Congo	1046	20	Philippines	1138	14
Djibouti	14	20	Sri Lanka	41	2
Egypt	1440	20	Syria	10,714	616
Equitorial Guinea	10	20	Mexico	3706	36
Eritrea	82	20	Canada	3245	104
Ethiopia	1409	20	United States	37,033	127
Gabon	27	20	Cuba	941	83
Gambia	29	20	Argentina	2530	67
Ghana	419	20	Belize	1	3
Guinea	172	20	Bolivia	573	67
Guinea-Bissau	29	20	Brazil	11,740	67
Kenya	643	20	Chile	1039	67
Lesotho	37	20	Colombia	2897	67
Liberia	66	20	Costa Rica	273	67
Libya	110	20	Iraq	15,091	616
Madagascar	345	20	Iran	168	2

Table 1. Hazardous Waste by Country. Source: [13,14].

African Countries	x1000 tons/yr	kg/Person/yr	Others (Selected Randomly)	X1000 tons/yr	kg/Person/yr
Malawi	243	20	Kazakhstan	130	8
Mali	257	20	Kiribati	1	14
Mauritania	57	20	Kuwait	25	10
Mauritius	0	0	Kyrgyzstan	6780	1329
Morocco	987	33	Laos	80	14
Mozambique	378	20	Puerto Rico	260	67
Namibia	41	20	Saint Kitts and Nevis	3	67
Niger	24	2	Saint Lucia	0	3
Nigeria	2469	20	St Vincent and The Grenadines	7	67
Rwanda	170	20	Trinidad and Tobago	87	67
Sao Tome and Principe	4	20	Hungary	3413	345
Senegal	202	20	Iceland	13	45
Seychelles	2	20	Ireland	492	126
Sierra Leone	98	20	Italy	4279	74
Somalia	194	20	Latvia	93	40
South Africa	915	20	Liechtenstein	4	118
Sudan	672	20	Lithuania	111	32
Swaziland	22	20	Luxemburg	101	253
Togo	98	20	Panama	206	67
Tunisia	198	20	Paraguay	380	67
Uganda	511	20	Peru	1785	67
Tanzania	741	20	Suriname	27	67
Western Sahara	6	20	Uruguay	226	67
Zambia	219	20	Venezuela	1678	67
Zimbabwe	261	20	Israel	325	52

Solid waste contaminates every habitat

Table 2-1: Major Disposal Site Accidents in Recent Years

Month/Year	City/Country	Number of victims	Accident cause
September 2016	Cotonou, Benin[10]	Over 100	Fire
March 2017	Addis Ababa, Ethiopia[11]	115	Collapse
August 2017	Conakry, Guinea[12]	9	Collapse
February 2018	Maputo, Mozambique[13]	17	Collapse

AFRICA SOLID WASTE MANAGEMENT
DATA BOOK 2019

Even when collected, waste is improperly disposed of in many cities. At least 70% of waste in Sub-Saharan Africa is disposed of in open dump sites.8 According to information received from 29 member cities of ACCP, 9 cities use open dumps, 5 cities use controlled disposal sites, 12 cities use sanitary landfills, and 3 cities answered unknown.9 Moreover, some dumpsites that were originally planned as sanitary landfills actually harm the surrounding environment because of improper operation. Open dumping often causes multiple problems. Besides the above-mentioned problems of insects and pests, other problems such as the contamination of surface and ground water from leachate, offensive odours, and fires are commonly observed. Open dumping sites without controls in place also release methane generated by decomposing organic waste into the atmosphere, which contributes to climate change. Worse still, mountains of waste have collapsed in numerous cities in recent years as a consequence of improper disposal site management and the excessive piling of waste at open dump sites, leading to the loss of many lives.

The meaning of the verb TO WASTE

waste

verb [T]

UK /weɪst/ US /weɪst/

waste *verb* [T] (USE BADLY)

B1

to use too much of something or use something badly when there is a limited amount of it:

- *You waste a lot of water by taking a bath instead of a shower.*
- *Come on, let's get started - we've wasted enough **time** already.*
- *Don't waste your **money** on such junk.*

From the Cambridge dictionary

The meaning of the noun WASTE

waste *noun* (UNWANTED MATTER)

B1 [C or U]

unwanted matter or material of any type, especially what is left after useful substances or parts have been removed:

- *This city produces 20 million tons of household waste each year.*
- *He opposes any kind of nuclear waste being dumped at sea.*
- *Millions of gallons of untreated human waste (= excrement) flow into the river every day.*
- *Oil spills are common, as is the dumping of toxic industrial wastes.*
- *The Japanese recycle more than half of their waste **paper**.*

From the Cambridge dictionary

Solid waste: municipal

Municipal waste are those daily we manage in our hands: packaging (overall), leftovers of food, electrical and electronic equipments, tea bags, furniture, expired medicines, batteries, and so on.....

IMAGE: UNSPLASH

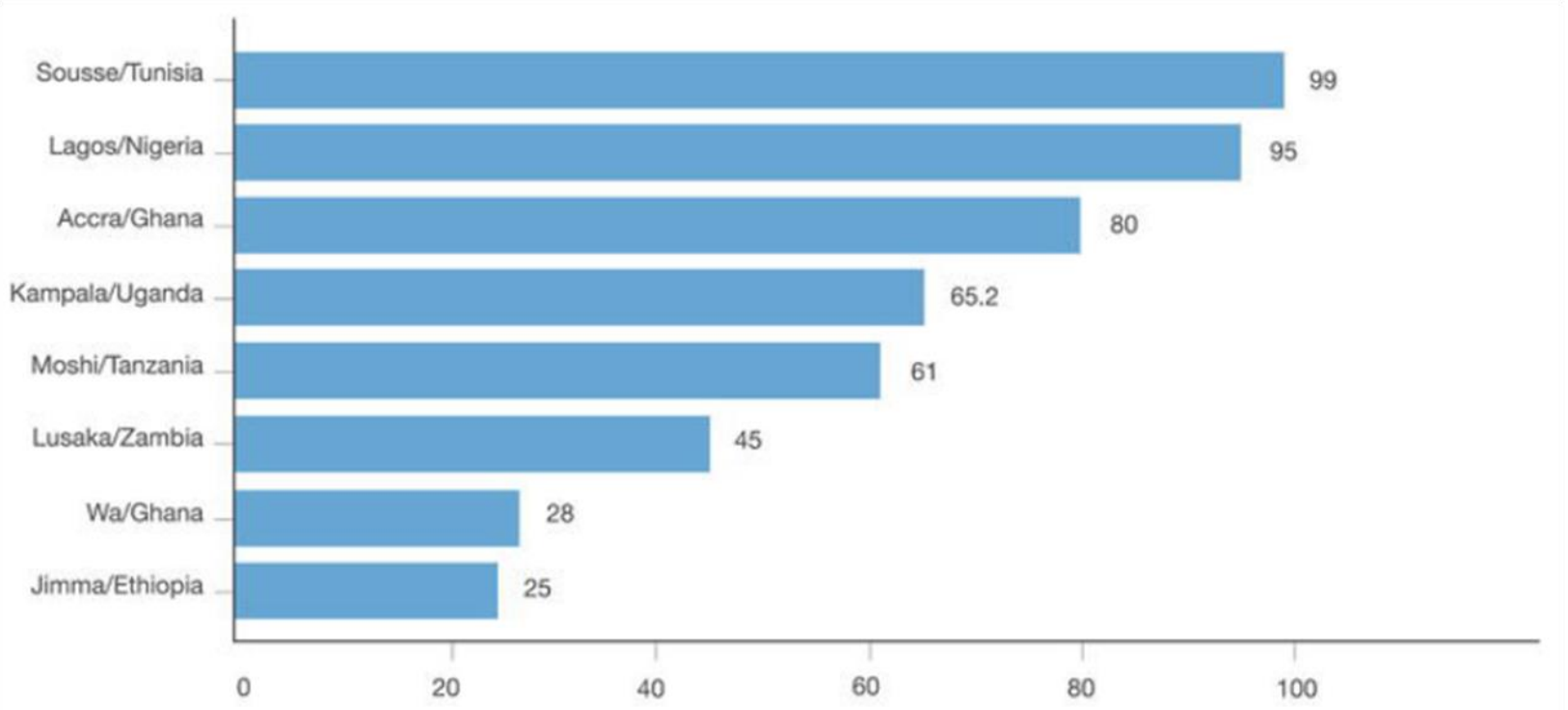
Every day, when we throw away something, we are throwing away **money**. We don't recognize that the "things" we're refusing consist in real materials, more or less precious.
Furthermore, too often those "things" will be dispersed in the environment, they will take tens of years to degrade, they will end up in the sea, we will find them on the beaches, in the parks, everywhere; they (we?) pollute water sources and aquifers.

- Isn't all this a wastage?
- Is it an offense we do to the environment?
- And ultimately to our community and future generations?

What can we do? And how?

With an integrated management approach.

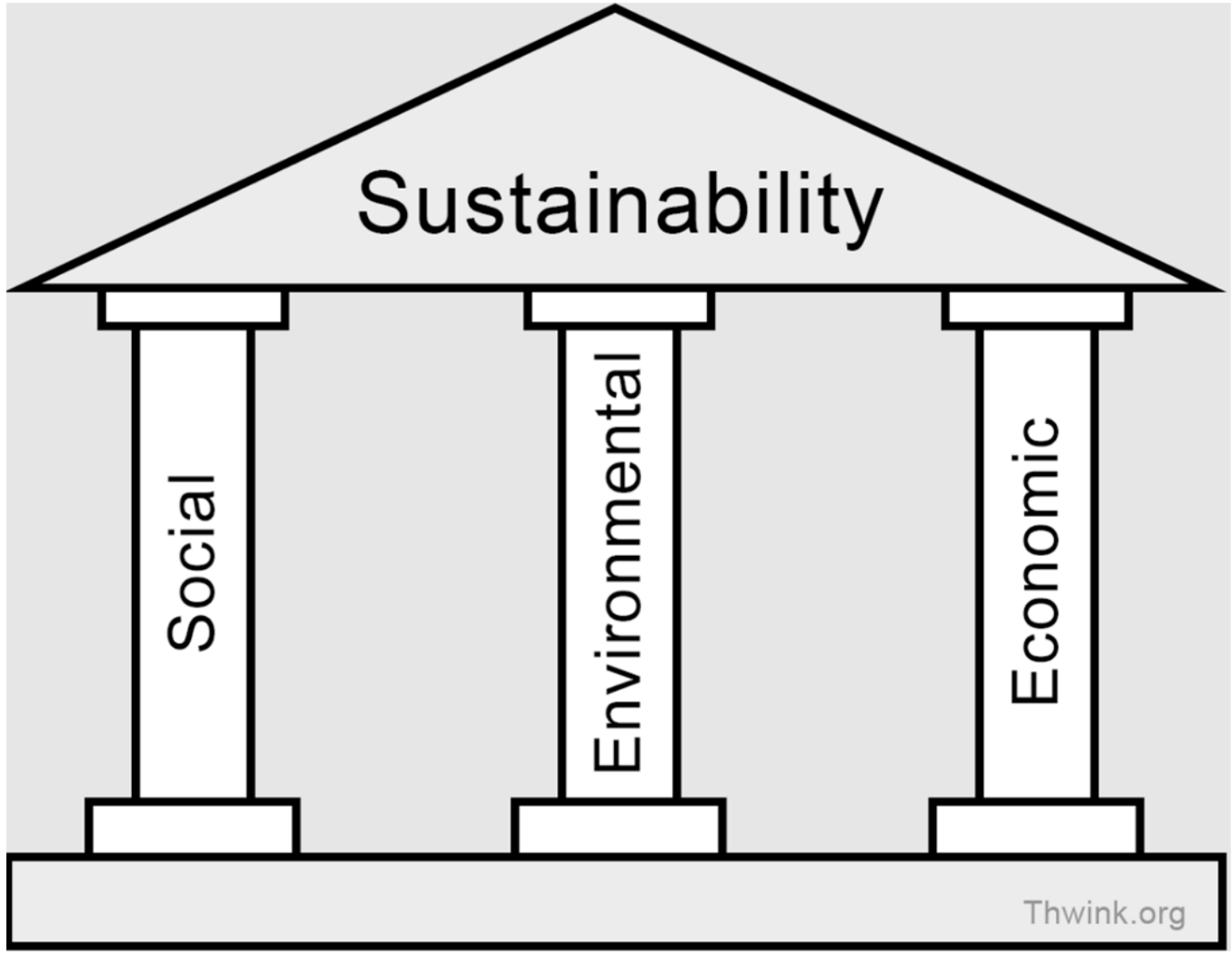
Waste collection coverage (%) in Africa



An integrated management of municipal waste is task of the public administration, which will activate a collection service, promote correct behaviors of citizens, collaborations with processing industries and will realize every action useful to reduce waste.

All that in order to prevent the pollution of the environment, to save money, to build a sustainable society.

The sustainability and its three pillars



The three pillars of the sustainability, one by one

- **Social**: the human capital, what mankind creates, as tools able to improve the citizens' quality of life, laws to support the necessity of the population and the development of improving politics in education, security and leisure, in order to build a well-cared and healthy society.
- **Environmental**: that is, to commit to study and practice the environmental preservation, the natural resources and the diminishing of the damage caused to the environment during the years.
- **Economic**: that is to production, distribution and consumption of goods and services. To have sustainability, companies can not profit at the expense of work exploitation or irresponsible and criminal exploitation of the environment.

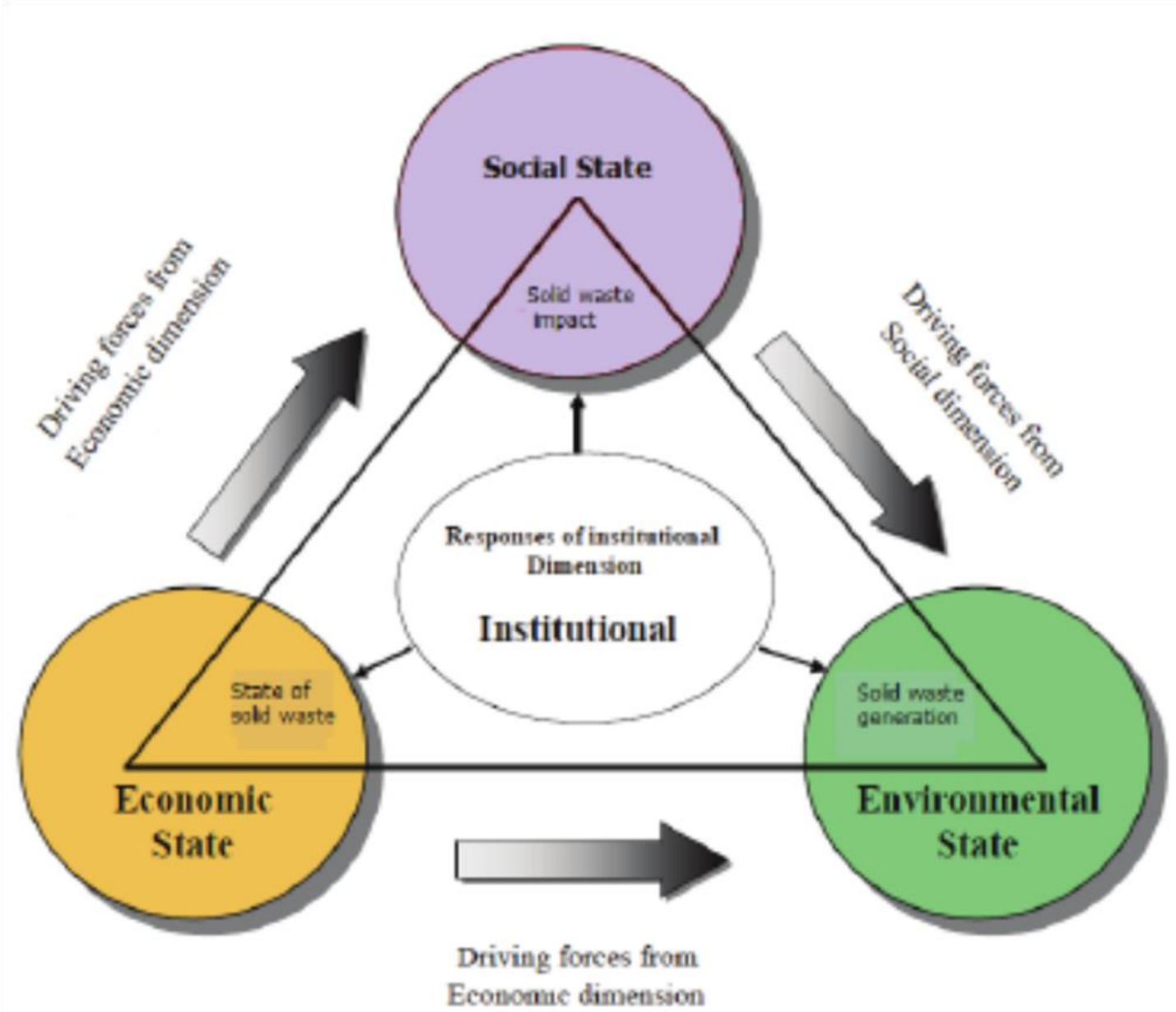
Sustainability and the time

- Sustainability therefore means working to ensure that a thing, a service, a product, an action takes into account the social, economic, environmental aspects, and that they last over time.
- The pillars of sustainability are based on a simple concept: we are all guests on Earth, we must commit ourselves to live to leave our place in better conditions than we found it. This is a right of future generations.

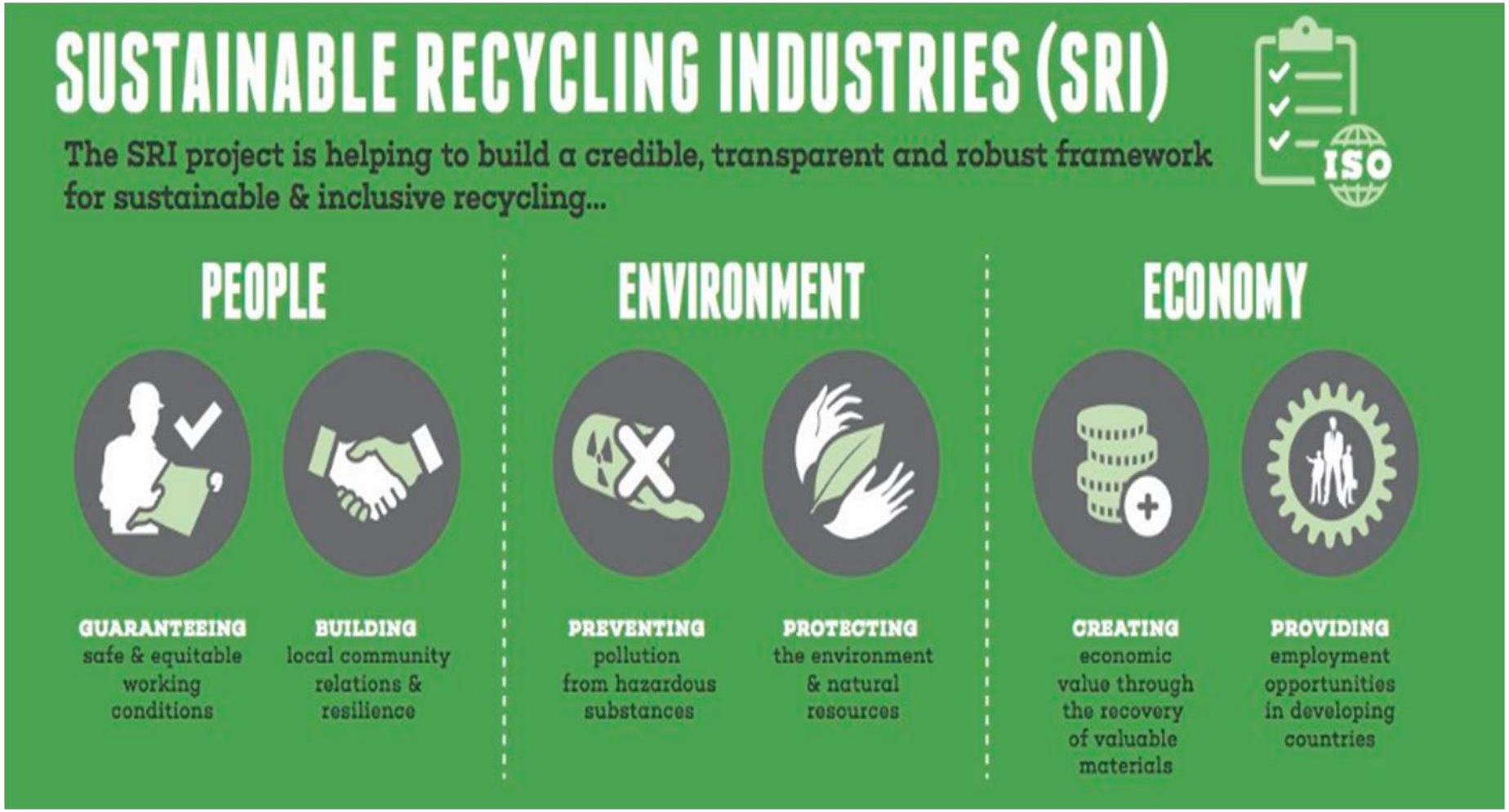
- Indeed, there is a forth pillar: training and studying.

The knowledge is the forth leg of the table

How does waste management relate to sustainability?

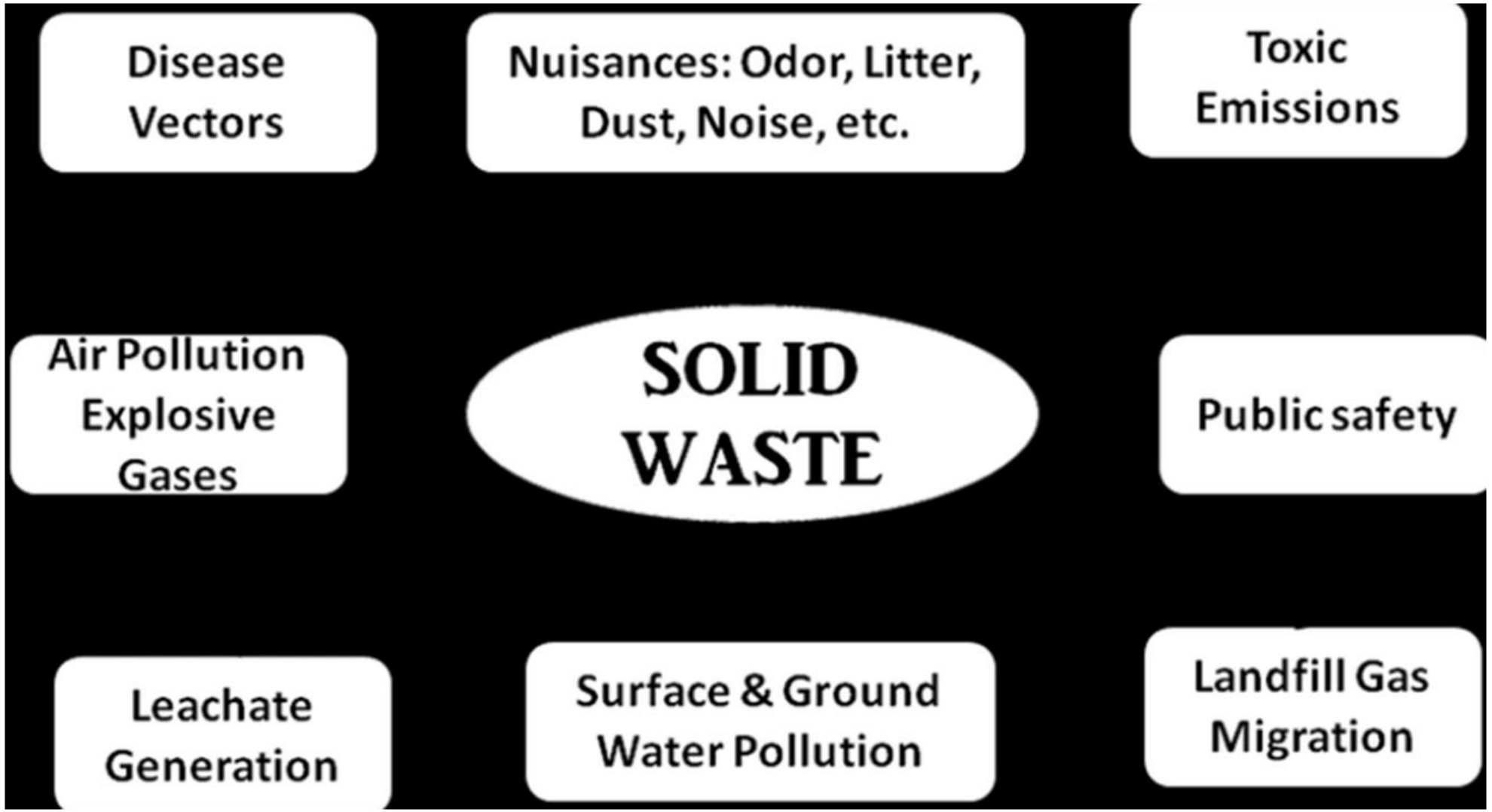


Waste and sustainability

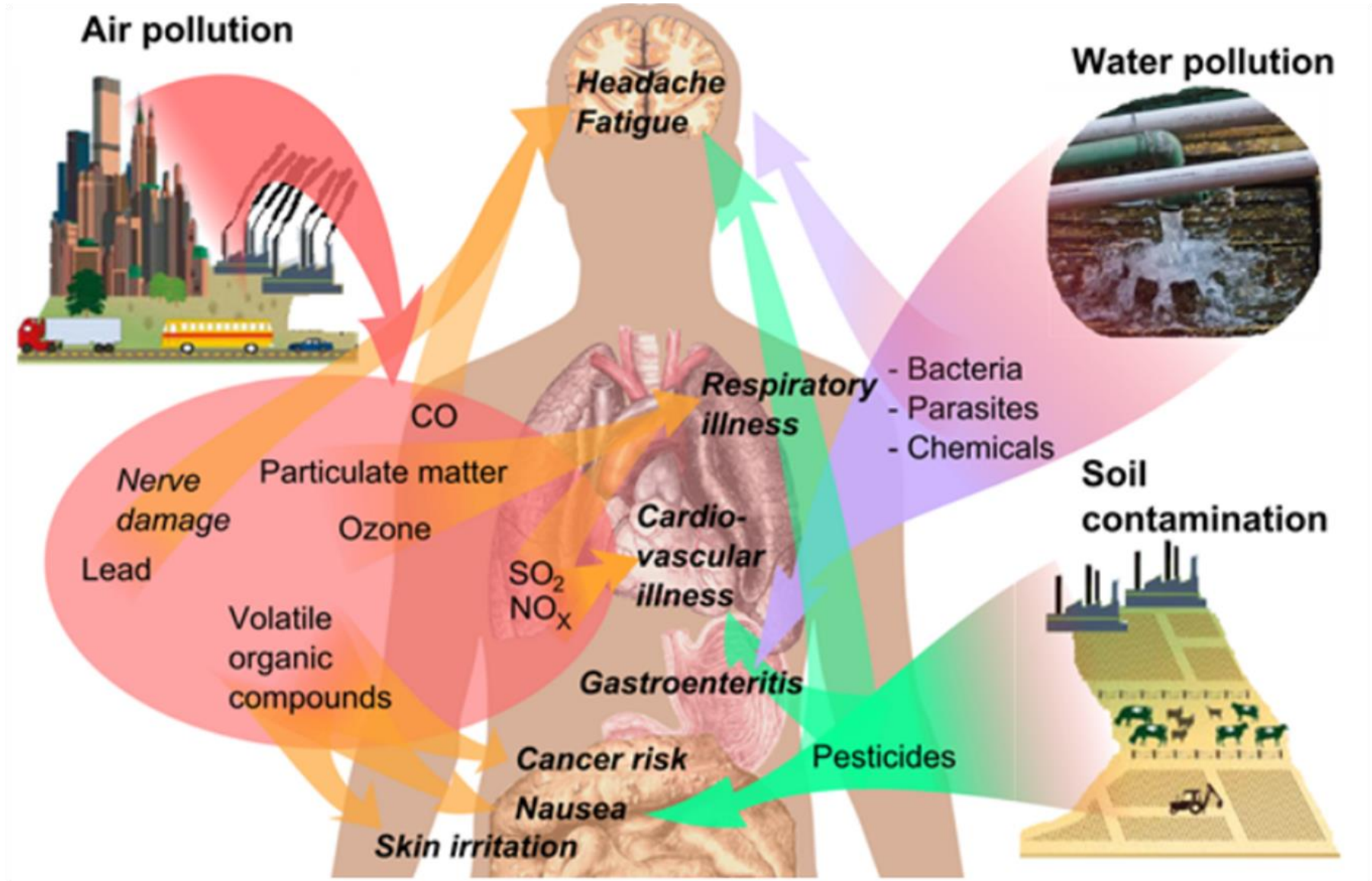


An integrated waste management project in South Africa

Environmental impacts produced by poor solid waste management systems

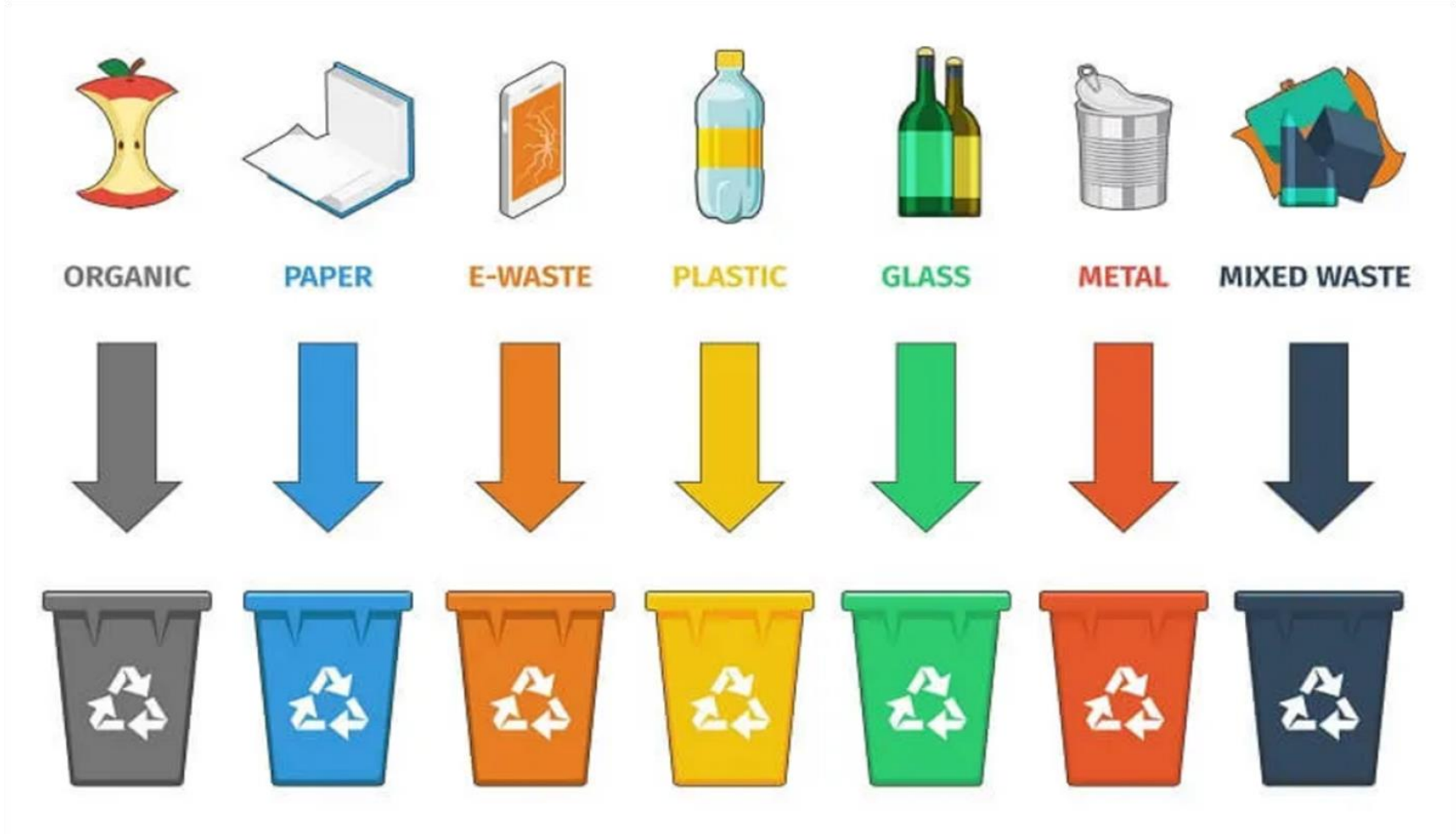


Health impacts of pollution produced by poor solid waste management

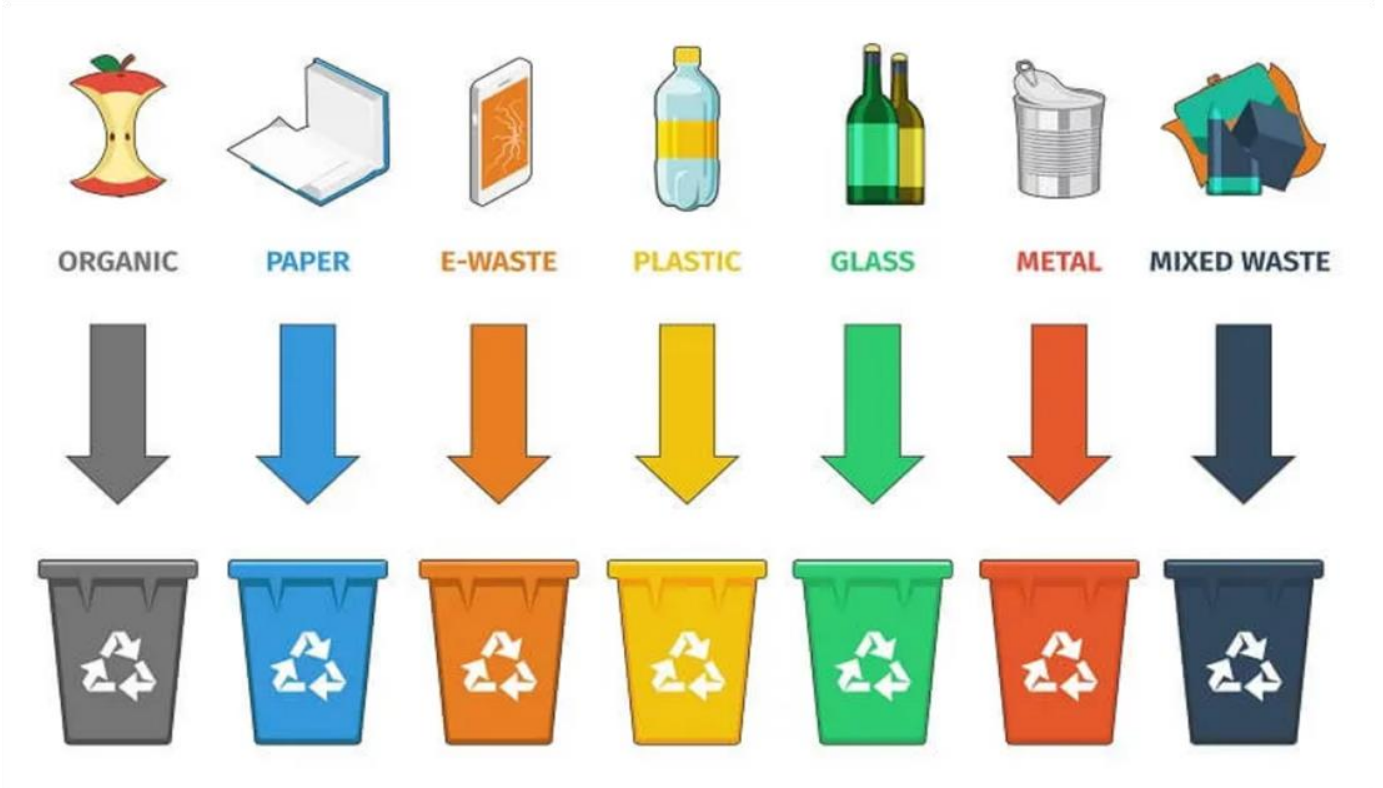


First approach to the integrated waste management

Promote the integrated waste management



Materials, not waste



From these buckets, the materials go to the processing industries

So, we will not go over this hill.
We will go <u>into</u> it, with open eyes.
To find out that we will be in a real mine.