Incineration: A Poor Solution for the Twenty First Century

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Gloucester, February 4, 2010

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Paul Connett
ha parlato
in
189 citta’

- **And on Jan 12, 2010, I gave a presentation (Zero Waste: Theory and Practice Around the World) before the Division for Sustainable Development at the United Nations**

OUTLINE

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1. A few words about Sustainability

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2. Arguments against incineration

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3. The Zero Waste 2020 Strategy

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6. Back to the Big Picture

DIFFERENT TIMES DEMAND DIFFERENT QUESTIONS

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20th CENTURY

WASTE MANAGEMENT

" How do we get rid of our waste efficiently with minimum damage to our health and the environment ?"

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" How do we get rid of our waste efficiently with minimum damage to our health and the environment ?"

21st CENTURY

RESOURCE MANAGEMENT

" How do we handle our discarded resources in ways which do not deprive future generations of some, if not all, of their value ?"

DIFFERENT TIMES DEMAND DIFFERENT QUESTIONS

20th CENTURY

WASTE MANAGEMENT

The key issue was SAFETY

21st CENTURY

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" How do we handle our discarded resources in ways which do not deprive future generations of some, if not all, of their value ?"

DIFFERENT TIMES DEMAND DIFFERENT QUESTIONS

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WASTE MANAGEMENT

The key issue was SAFETY

21st CENTURY

RESOURCE MANAGEMENT

The key issue is SUSTAINABILIY

Sustainability

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- We would need FOUR planets if every one consumed as much as the average American

Sustainability

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- We would need TWO planets if every one consumed as much as the average European

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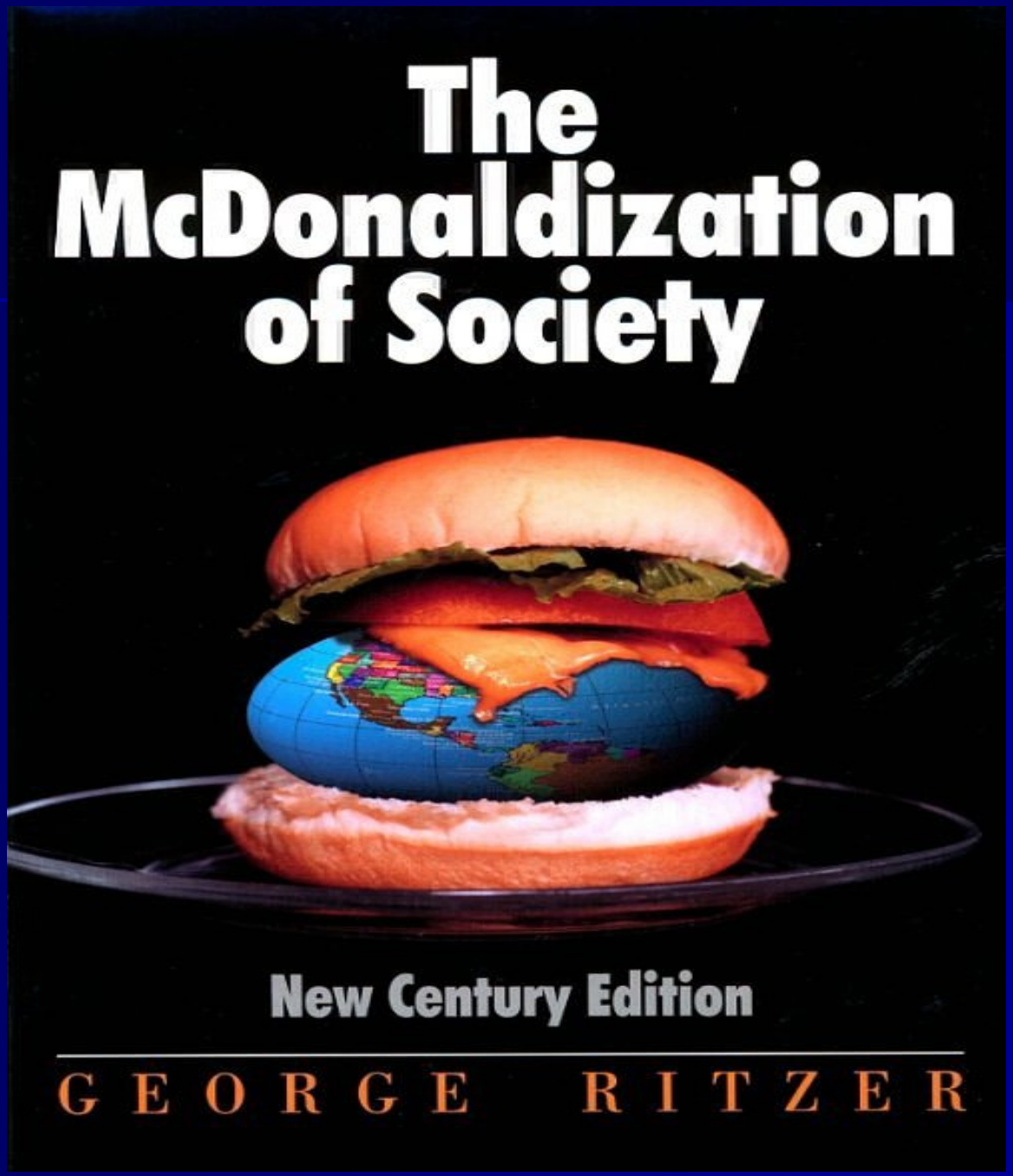
Sustainability

- We would need FOUR planets if every one consumed as much as the average American
- We would need TWO planets if every one consumed as much as the average European
- Meanwhile, India, China etc. are copying our consumption patterns
- Something has got to change and the best place to start is with waste

We are living on this planet as if we had another one to go to


The McDonaldization of Society
New Century Edition
GEORGE RITZER

We cannot run a throwaway society on a finite planet

We cannot run a throwaway society on a finite planet

Waste is the evidence that we are doing something wrong

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Waste is the evidence that we are doing something wrong

Landfills **BURY** the evidence

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Incinerators **BURN** the evidence

We cannot run a throwaway society on a finite planet

Waste is the evidence that we are doing something wrong

Landfills BURY the evidence

Incinerators BURN the evidence

We need to face the real problem…

Our real task is to fight over-consumption

"The world has enough for everyone's need but not for everyone's greed"

Mahatma Gandhi

Not only is
over-consumption
giving us a local waste crisis
but also…

… a Global crisis

… a Global crisis

Global warming is a symptom

… a Global crisis

Global warming is a symptom
Over-consumption is the cause

The Global Crisis:

Since the Industrial Revolution we have imposed a linear society on a planet that functions in circles

A LINEAR SOCIETY

A LINEAR SOCIETY

Extraction

A LINEAR SOCIETY

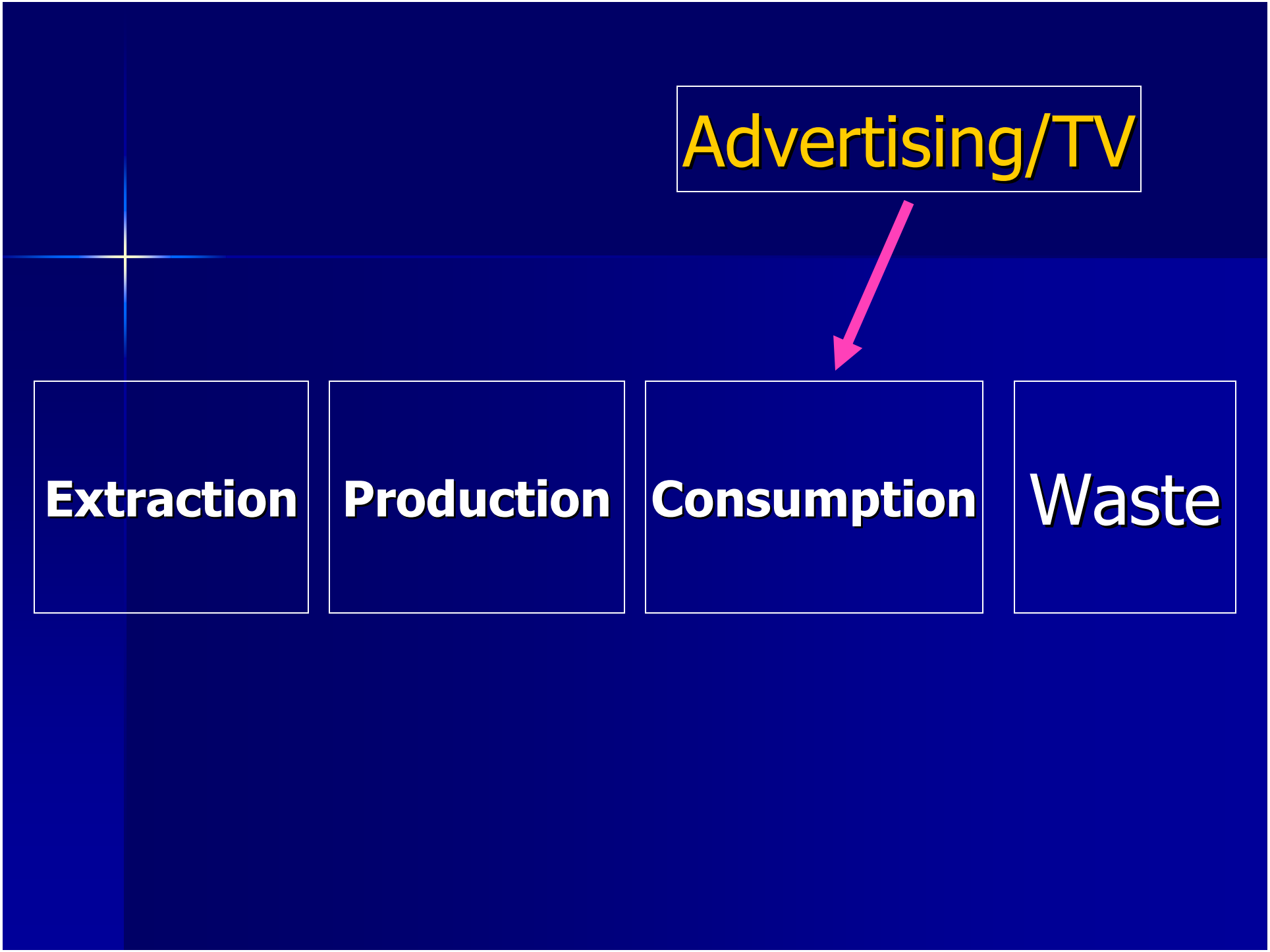
Extraction **Production**

A LINEAR SOCIETY

Extraction **Production** **Consumption**

A LINEAR SOCIETY

Extraction | **Production** | **Consumption** | Waste


Advertising/TV
Extraction
Production
Consumption
Waste

Over-advertising
produces
Over-consumption

By the time a high school student leaves school, he or she will have watched over 350,000 TV commercials.

Paul Hawken
The Ecology of Commerce.

Myth versus Reality

Myth versus Reality

- THE MYTH:

Myth versus Reality

- THE MYTH:
- The more you consume the happier you become

Myth versus Reality

- THE MYTH:
- The more you consume the happier you become
- THE REALITY:

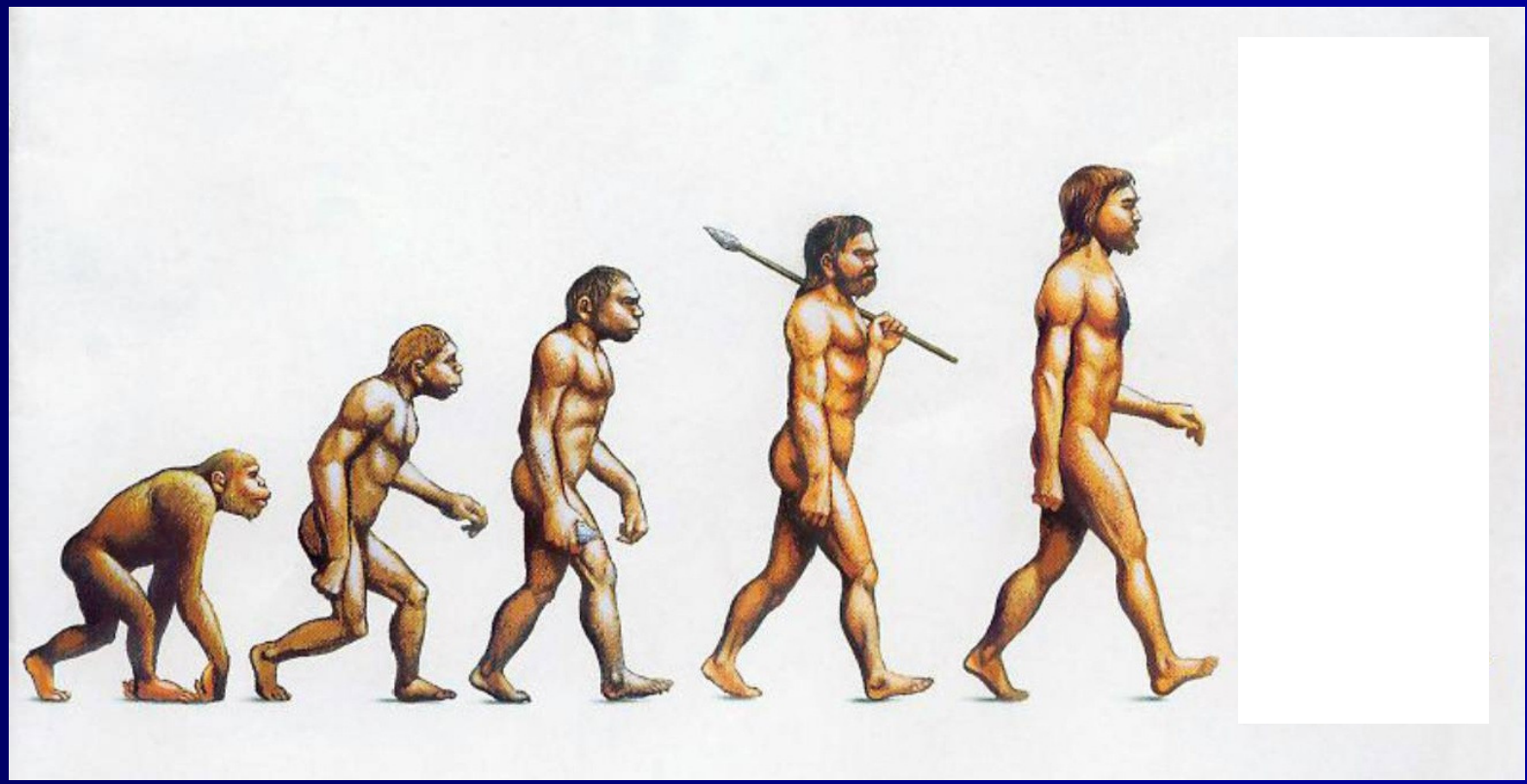
Myth versus Reality

- THE MYTH:
- The more you consume the happier you become
- THE REALITY:
- The more you consume the fatter you become!

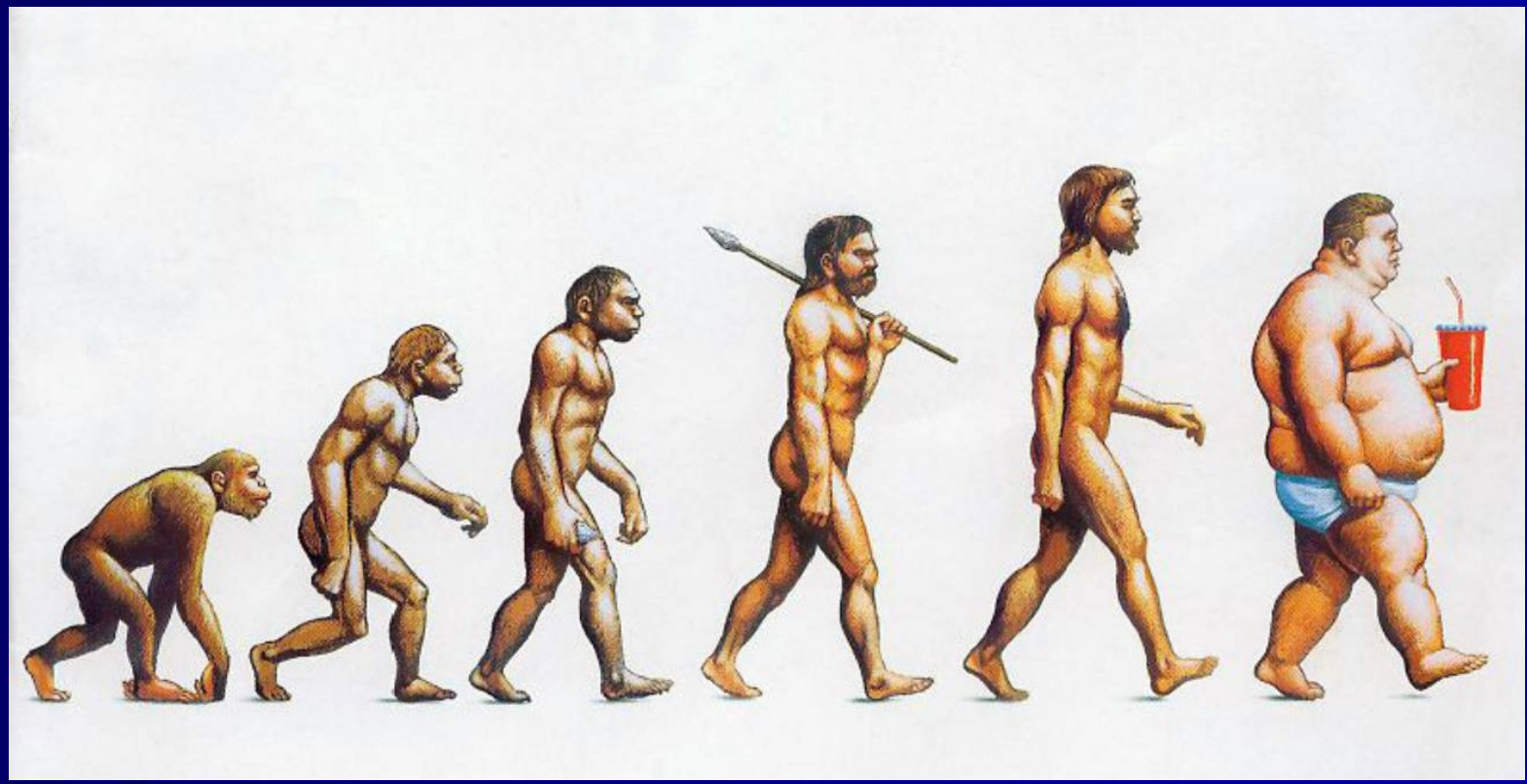
Myth versus Reality

- THE MYTH:
- The more you consume the happier you become
- THE REALITY:
- The more you consume the fatter you become!
- And the more waste you produce

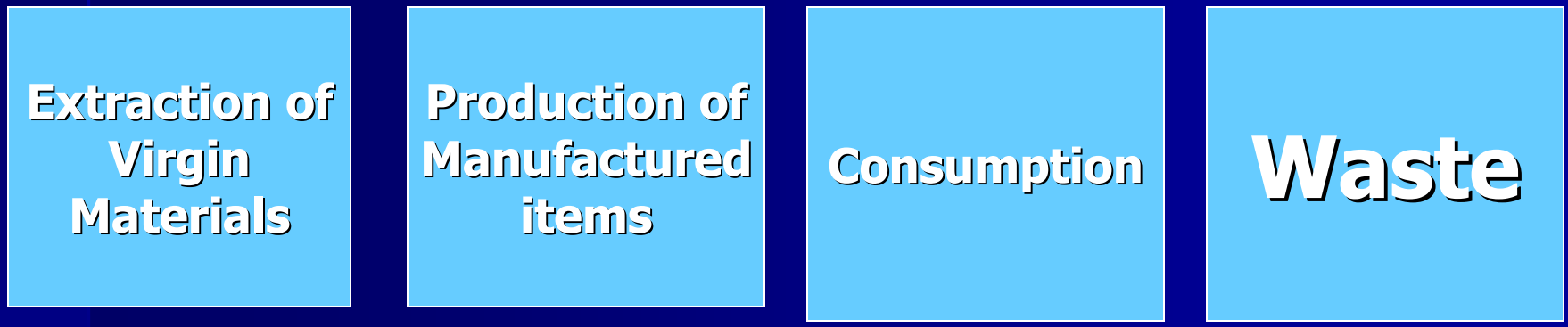
Man



Modern Man!



A LINEAR SOCIETY



A LINEAR SOCIETY

ENERGY

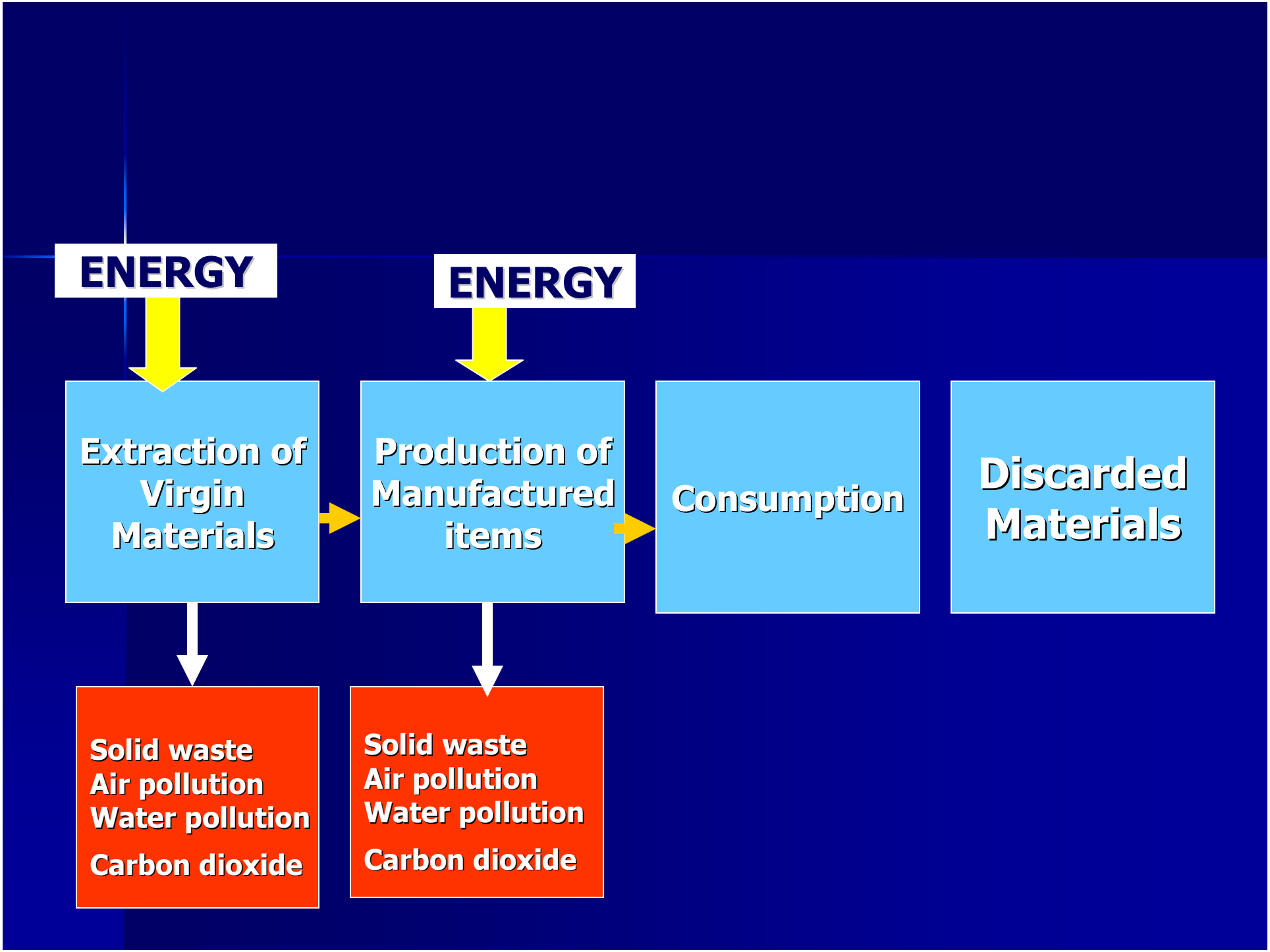
Extraction of Virgin Materials

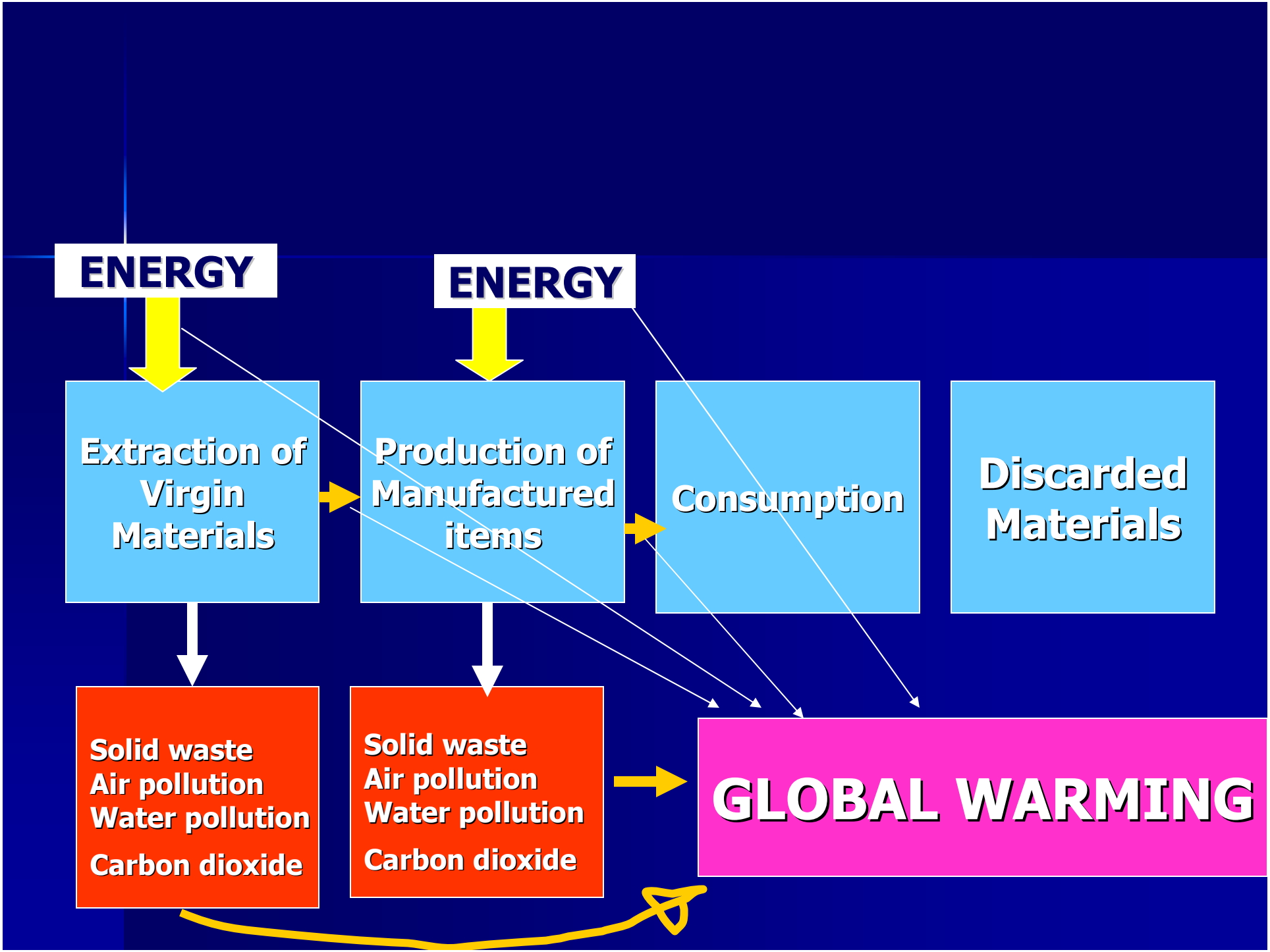
Production of Manufactured items

Consumption

Waste

A LINEAR SOCIETY


ENERGY
ENERGY
Extraction of Virgin Materials
Production of Manufactured items
Consumption
Discarded Materials
Solid waste
Air pollution
Water pollution
Carbon dioxide
Solid waste
Air pollution
Water pollution
Carbon dioxide


ENERGY
ENERGY
Extraction of Virgin Materials
Production of Manufactured items
Consumption
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Air pollution
Water pollution
Carbon dioxide
Solid waste
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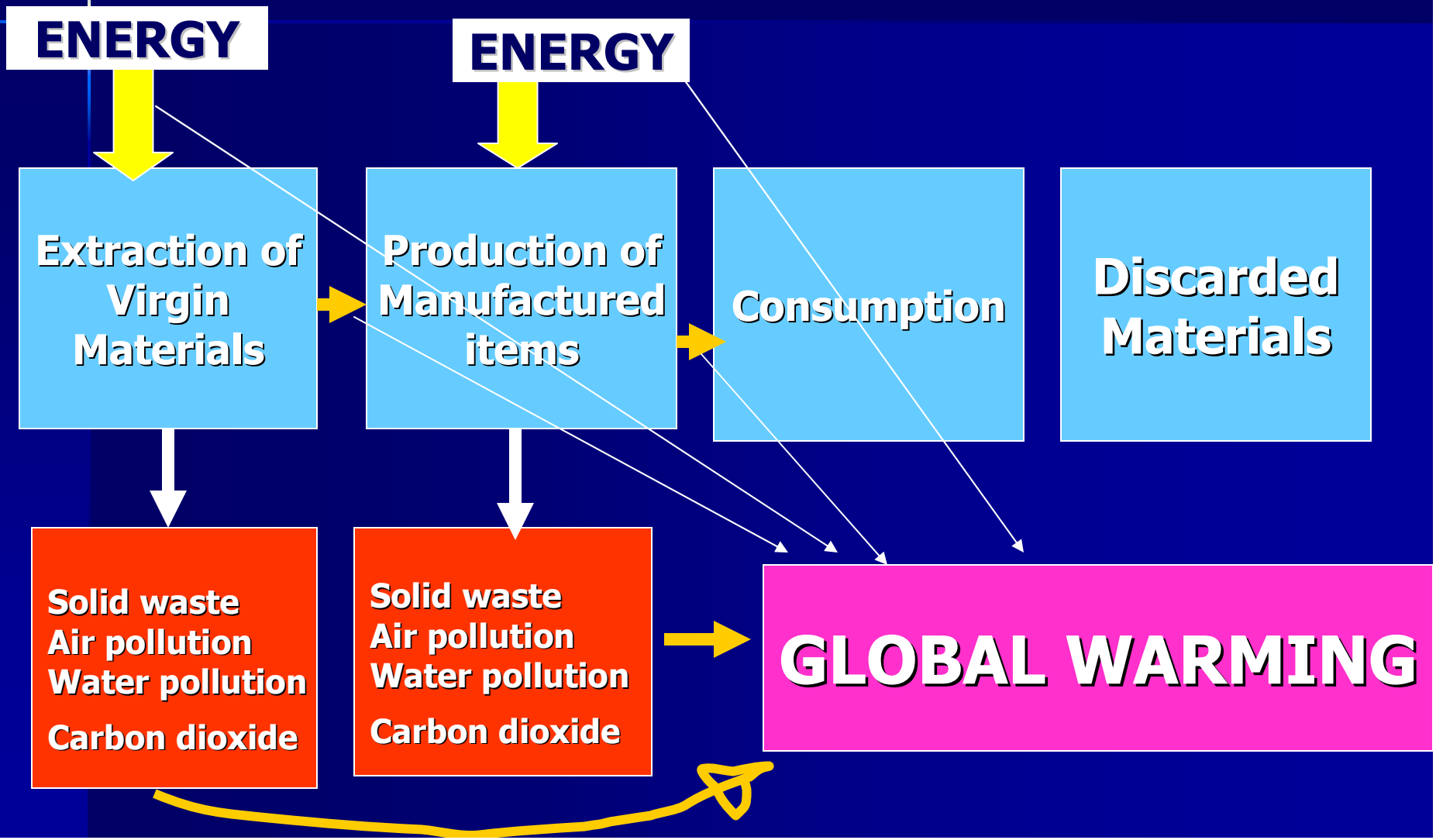
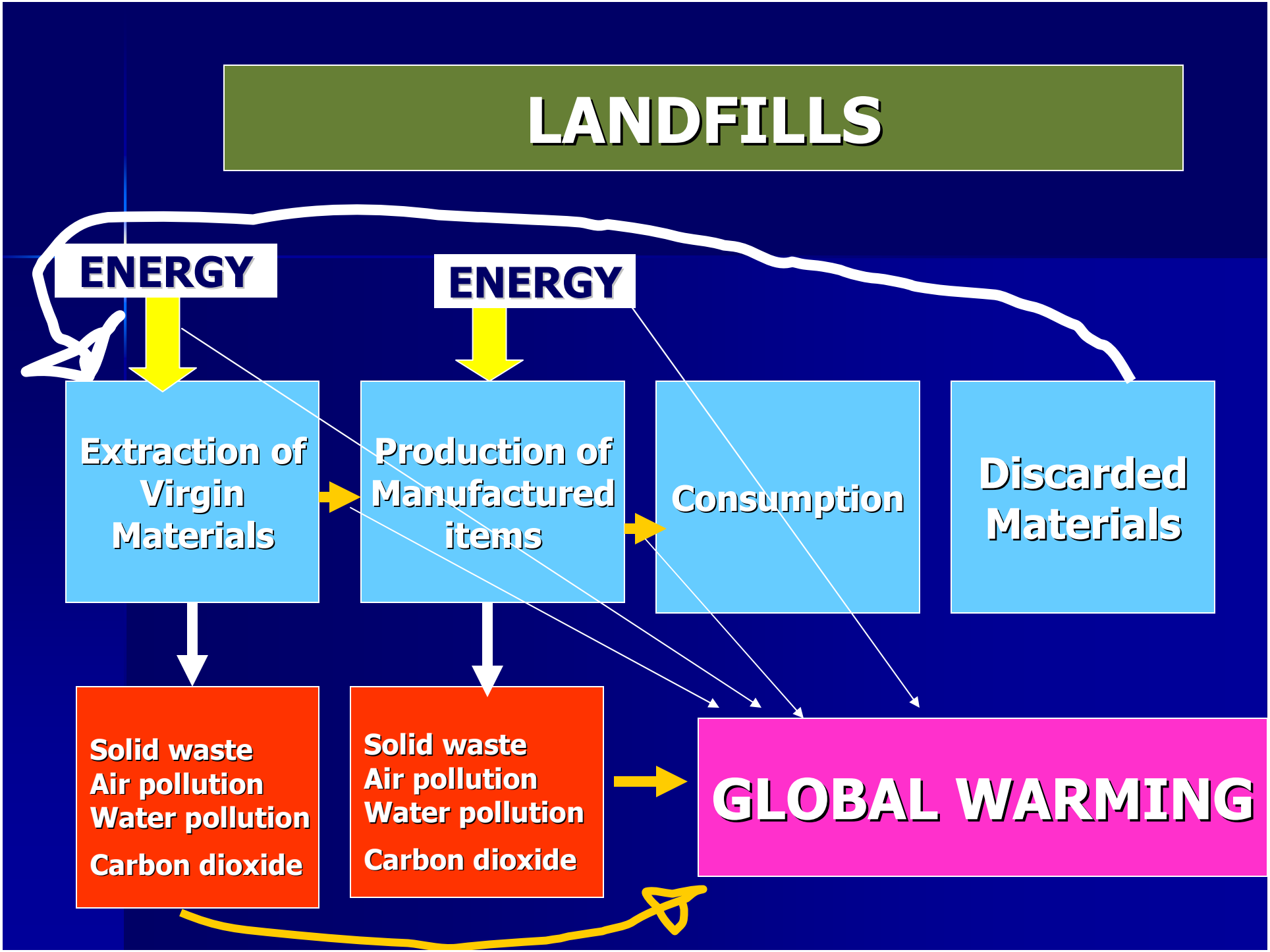
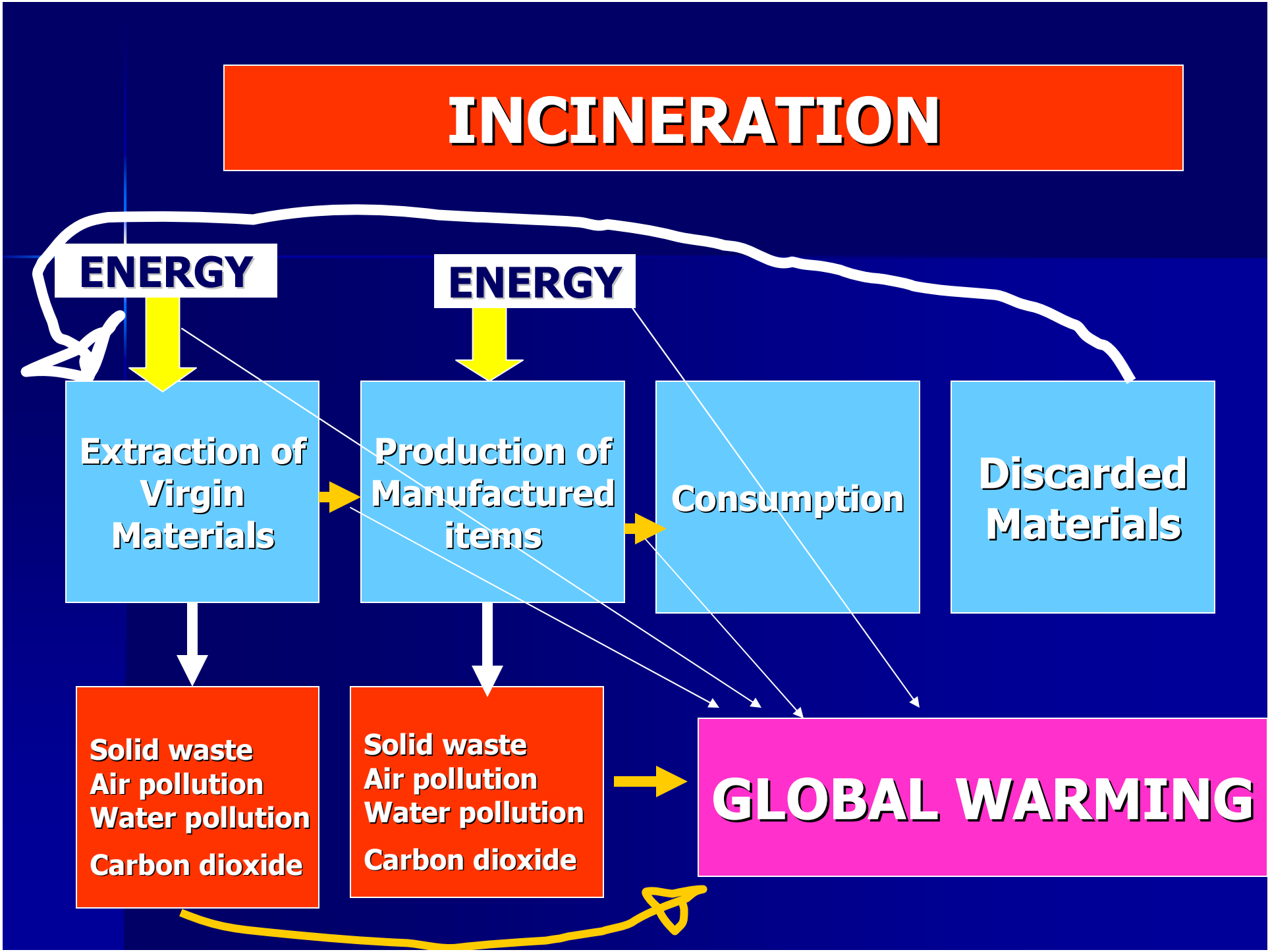
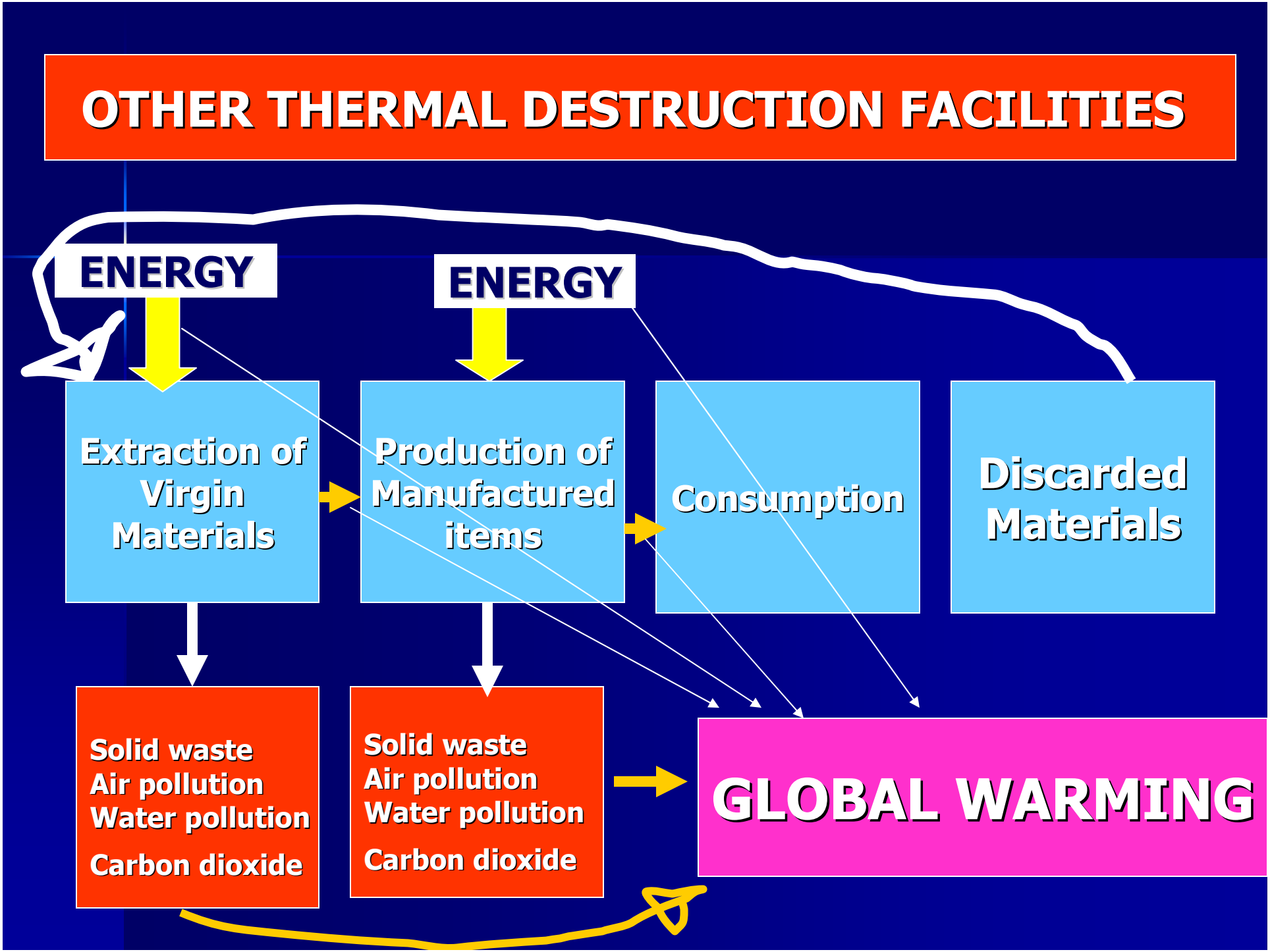
Water pollution
Carbon dioxide
GLOBAL WARMING

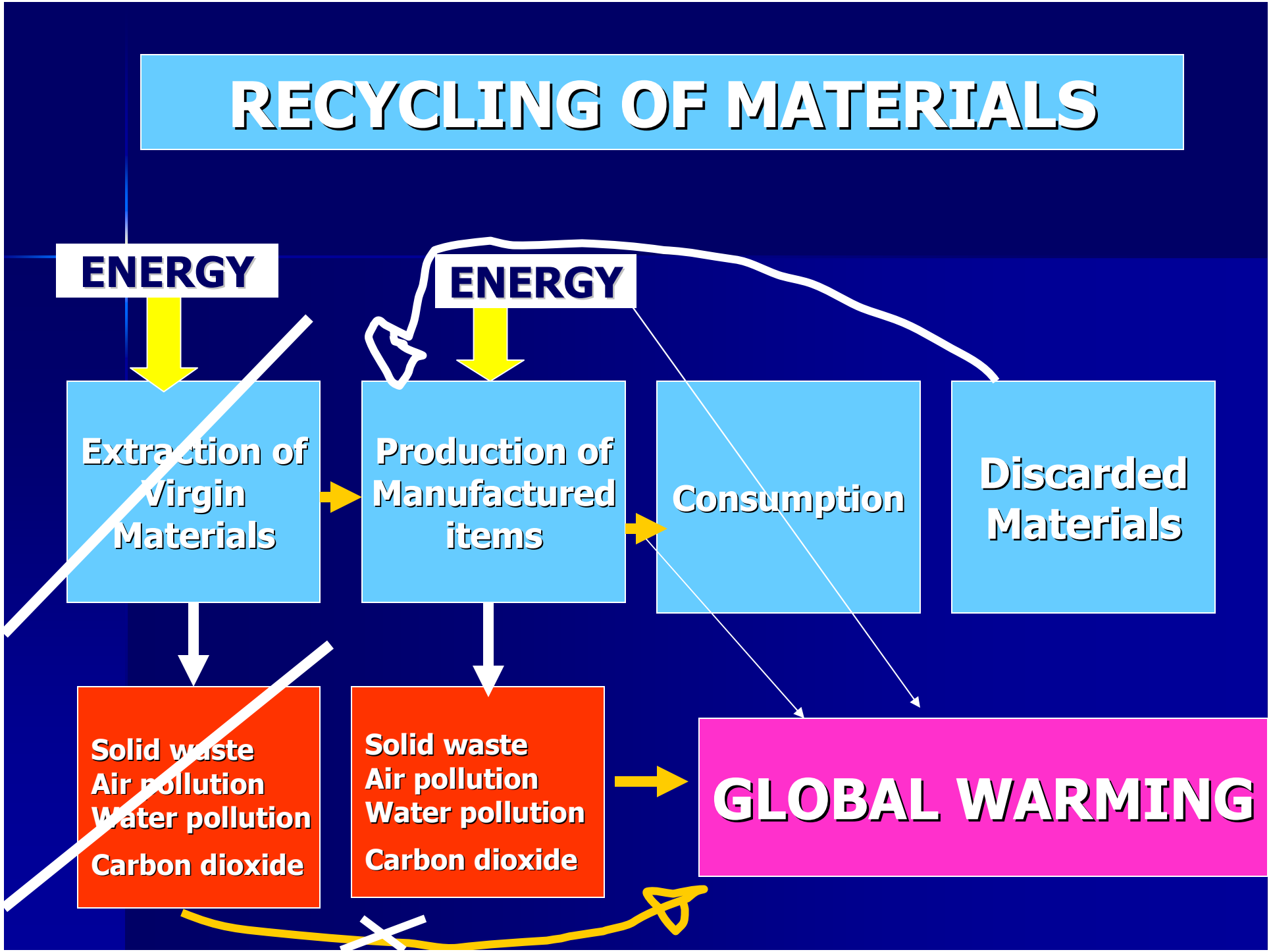
How do waste management practices affect this picture?

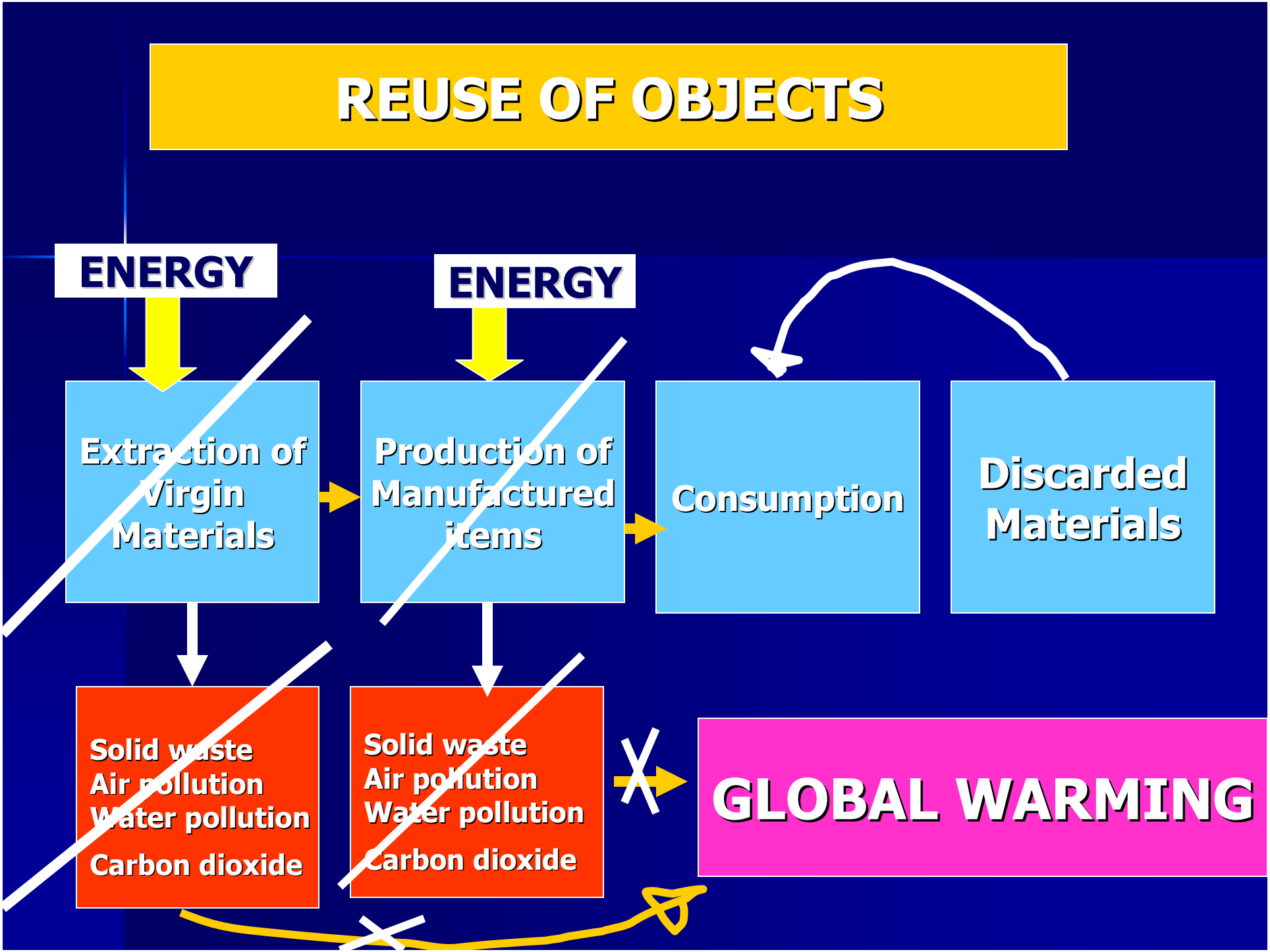


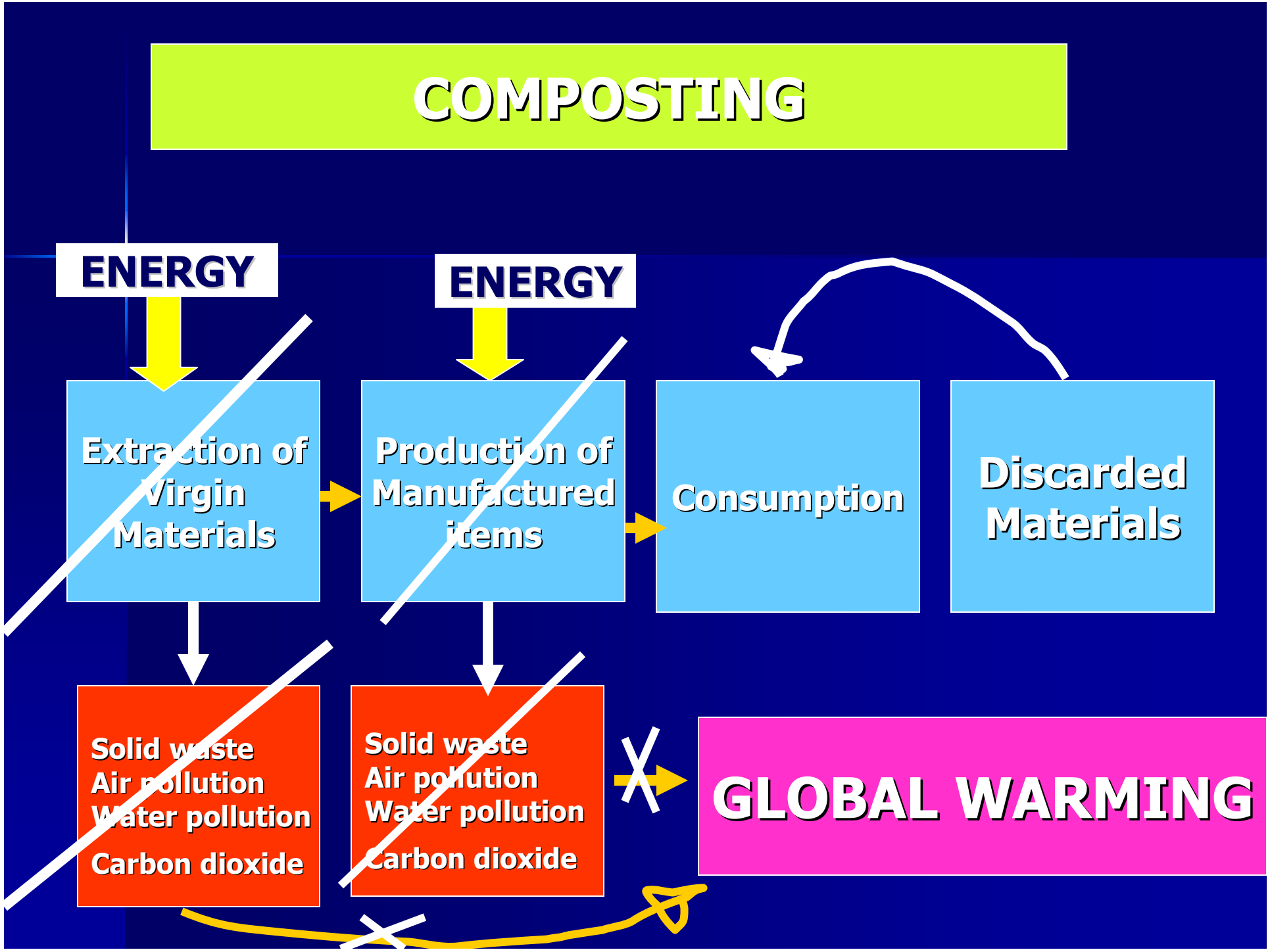

LANDFILLS
ENERGY
ENERGY
Extraction of Virgin Materials
Production of Manufactured items
Consumption
Discarded Materials
Solid waste
Air pollution
Water pollution
Carbon dioxide
Solid waste
Air pollution
Water pollution
Carbon dioxide
GLOBAL WARMING


INCINERATION
ENERGY
ENERGY
Extraction of Virgin Materials
Production of Manufactured items
Consumption
Discarded Materials
Solid waste
Air pollution
Water pollution
Carbon dioxide
Solid waste
Air pollution
Water pollution
Carbon dioxide
GLOBAL WARMING


OTHER THERMAL DESTRUCTION FACILITIES
ENERGY
ENERGY
Extraction of Virgin Materials
Production of Manufactured items
Consumption
Discarded Materials
Solid waste
Air pollution
Water pollution
Carbon dioxide
Solid waste
Air pollution
Water pollution
Carbon dioxide
GLOBAL WARMING


RECYCLING OF MATERIALS
ENERGY
ENERGY
Extraction of Virgin Materials
Production of Manufactured items
Consumption
Discarded Materials
Solid waste
Air pollution
Water pollution
Carbon dioxide
Solid waste
Air pollution
Water pollution
Carbon dioxide
GLOBAL WARMING


REUSE OF OBJECTS
ENERGY
ENERGY
Extraction of Virgin Materials
Production of Manufactured items
Consumption
Discarded Materials
Solid waste
Air pollution
Water pollution
Carbon dioxide
Solid waste
Air pollution
Water pollution
Carbon dioxide
GLOBAL WARMING


COMPOSTING
ENERGY
ENERGY
Extraction of Virgin Materials
Production of Manufactured items
Consumption
Discarded Materials
Solid waste
Air pollution
Water pollution
Carbon dioxide
Solid waste
Air pollution
Water pollution
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GLOBAL WARMING

COMPOST

Kg Greenhouse gas/tonne Municipal Waste

A combination of recycling and composting	-461
Incineration generating electricty	-10

Waste Management Options and Climate Change. AEA 2001

Kg Greenhouse gas/tonne Municipal Waste

A combination of recycling and composting is 46 times better	-461
at reducing greenhouse gases than	X 46
Incineration generating electricty	-10

Waste Management Options and Climate Change. AEA 2001

Incineration is a waste of energy!

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- About 4 X more energy saved by reusing, recycling and composting the various components in the discard stream

Incineration is a waste of energy!

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- Contact: Dr. Jeffrey Morris, jeff.morris@zerowaste.com

Energy Comparison: Recycling versus incineration (ICF consulting, 2005)

material	Energy savings from recycling GJ/tonne	Energy output from incineration GJ/tonne	Energy savings recycling versus incineration
Newsprint	6.33	2.62	2.4
Fine paper	15.87	2.23	7.1
Cardboard	8.56	2.31	3.7
Other paper	9.49	2.25	4.2
HDPE	64.27	6.30	10.2
PET	85.16	3.22	26.4
Other plastic	52.09	4.76	10.9

Incineration is not sustainable

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- Incineration does not challenge the **over-consumption** of finite resources.

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- Every time we burn something we have to return to the beginning of the extraction, manufacture and consumption system.
- Incineration wastes energy
- Incineration wastes the opportunity to really fight global warming
- IN SHORT: Incineration sabotages genuine moves towards sustainability

2. OTHER arguments against incineration

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2. OTHER arguments against incineration

1) It is a poor economic investment
2) Very few jobs created for very large capital investment
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4) It is very inflexible and stifles innovation
5) It generates a toxic ash

OTHER arguments against incineration (continued)

OTHER arguments against incineration (continued)

6) It doesn't get rid of landfills

OTHER arguments against incineration (continued)

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7) It produces toxic air emissions

OTHER arguments against incineration (continued)

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8) Incineration is extremely unpopular with the public

OTHER arguments against incineration (continued)

6) It doesn't get rid of landfills

7) It produces toxic air emissions

8) Incineration is extremely unpopular with the public

9) There is a far better and sustainable alternative

1. Incineration is a poor investment

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- Most of the money spent on incinerators goes into complicated machinery and leaves the community (and even the country)
- Over half the money spent on a modern incinerator goes into air pollution control equipment
- Incineration (without massive subsidies) is one of the most expensive way of generating electricity

2. Incineration creates very few jobs

An incinerator in Brescia, Italy

The Brescia incinerator cost 300,000,000 Euro and has created just 80 jobs.

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Another 500,000,000 Euros of taxpayers money spent on so called "alternative energy"

- **In contrast, the money spent on the alternatives goes into jobs and stays in the community.**

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- Diverted 50% of waste from landfill in 5 years (Halifax ~ 60%)

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- 1000 jobs created in collection and treatment of recyclables and compostables
- Another 2000 jobs created in the industries handling the recovered materials

3. Incineration wastes valuable time!

- It takes about 25 years (or more) to pay off the massive capital investment costs involved with building an incinerator.
- We don't have 25 years to waste on a non-sustainable solution!

4. Incineration stifles innovation

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- "An incinerator needs to be fed for about 20 to 30 years and in order to be economic needs an enormous input from quite a region, so for 20 to 30 years you stifle innovation, you stifle alternatives, just in order to feed that monster which you build"

4. Incineration stifles innovation

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- Ludwig Kraemer, former Head of EU Waste Management, BBC 1 Panorama Documentary "Rubbish"

5. Incinerators produce a toxic ash

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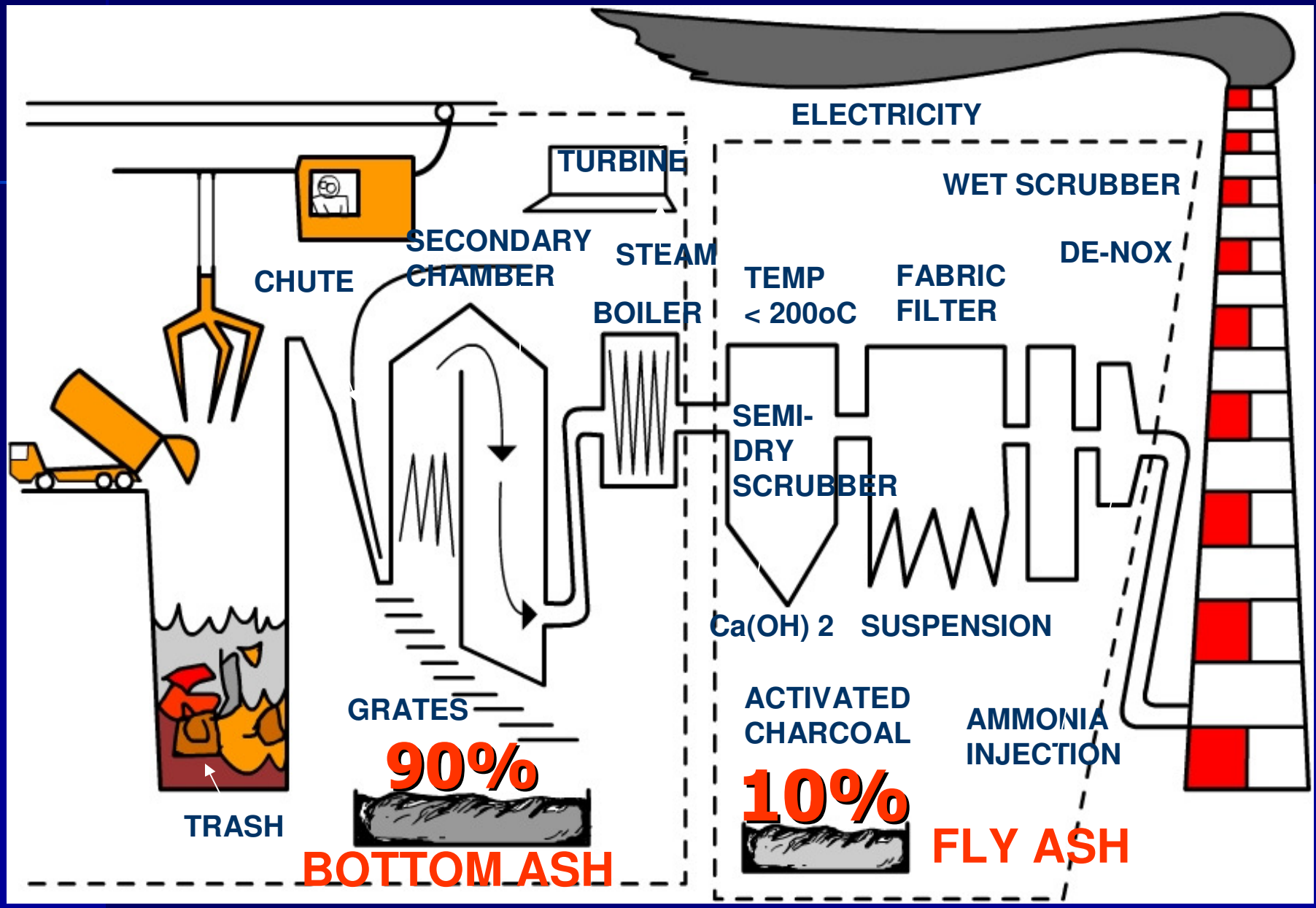
5. Incinerators produce a toxic ash

- For every four tons of waste burned you get one ton of ash (or more)
- That nobody wants!

For every 4 tons of trash you get about one ton of ash



Ash is toxic and difficult to get rid of

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- In Germany & Switzerland fly ash put into nylon bags and placed in salt mines

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Ash is toxic and difficult to get rid of

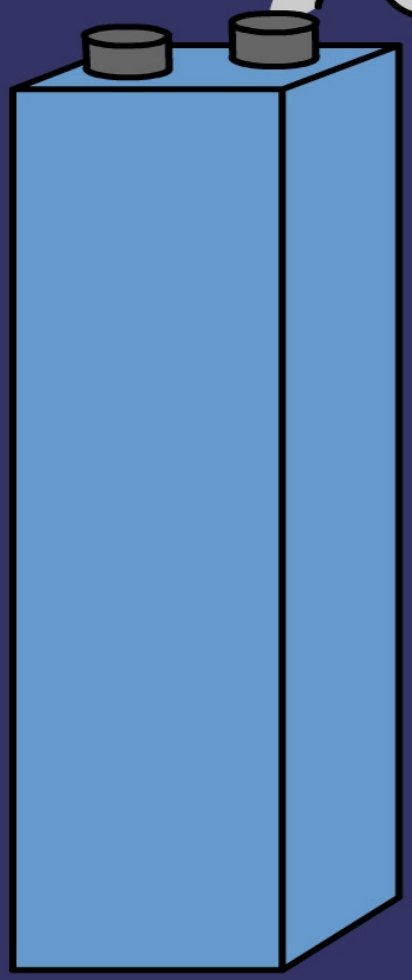
- In Germany & Switzerland fly ash put into nylon bags and placed in salt mines
- In Japan some incinerators vitrify the ash
- In Denmark…
- They send all the ash to Norway!

6. Incineration does not get rid of landfills

- You still need a landfill for the toxic ash

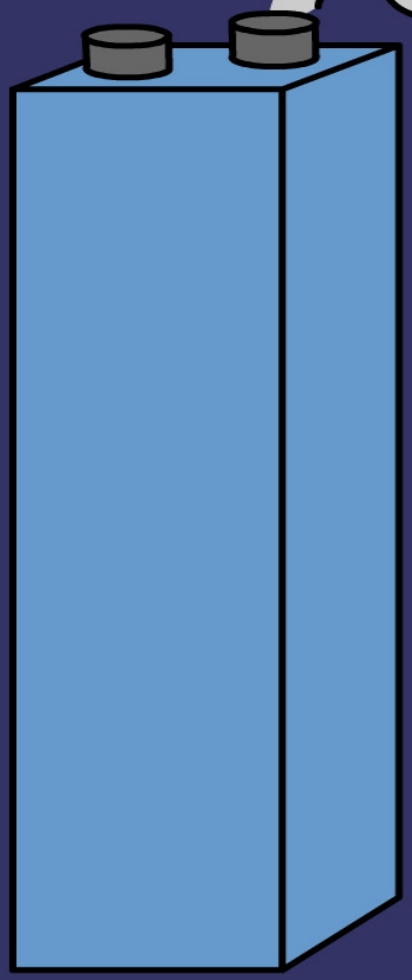
7. Incinerators put many highly toxic and persistent substances into the air

AIR EMISSIONS



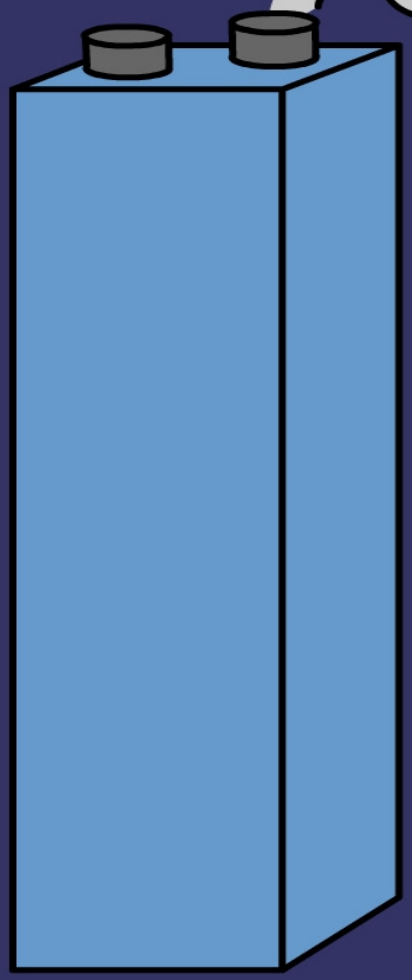
- CO2 + H2O
- ACID GASES:
  HCl, HF, SO_2
  NO_x
-
-

AIR EMISSIONS



- CO2 + H2O
- ACID GASES:
  HCl, HF, SO_2
  NO_x
- TOXIC METALS:
  Pb, Cd, Hg, As, Cr etc

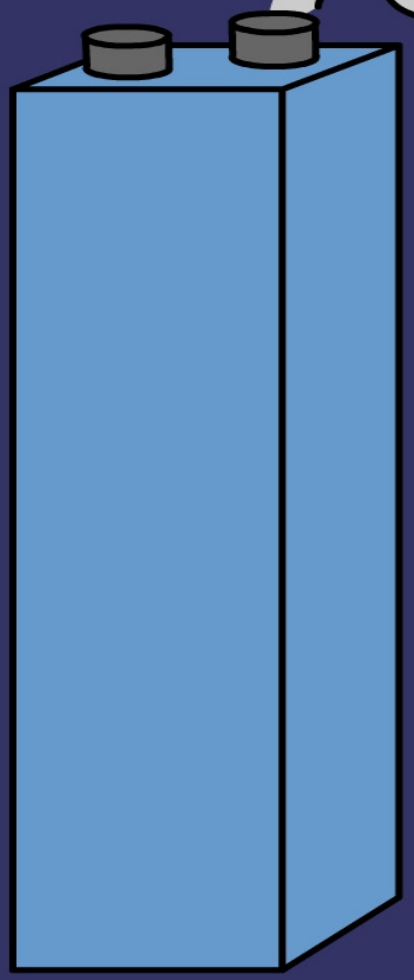
AIR EMISSIONS



- CO2 + H2O
- ACID GASES:
  HCl, HF, SO_2
  NO_x
- TOXIC METALS:
  Pb, Cd, Hg, As, Cr etc
- NEW COMPOUNDS:

  PCDDs (DIOXINS)
  PCDFs (FURANS)
  PCB's
  ETC

AIR EMISSIONS



- CO2 + H2O
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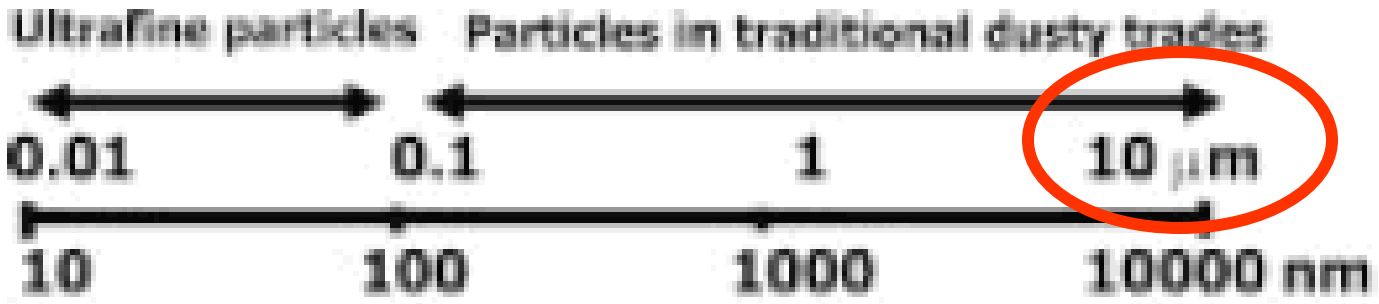
NANO PARTICLES



Size of Particle regulated in incinerator emissions

NANOPARTICLES

Figure 3 Relative size of ultrafine particles compared with particles in traditional dusty trades.

Incineration, nanoparticles & Health

Statement of Evidence

Particulate Emissions and Health Proposed

Ringaskiddy Waste-to-Energy Facility

Professor C. Vyvyan Howard MB. ChB. PhD. FRCPath. June 2009

VYV.howard@googlemail.com

Nanoparticles & Health

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15. *Kim, C.S. and P.A. Jaques, Respiratory dose of inhaled ultrafine particles in healthy adults. Philosophical Transactions of the Royal Society of London. Series A: Mathematical, Physical and Engineering Sciences, 2000. 358(1775): p. 2693-2705.*

Incineration and nanoparticles

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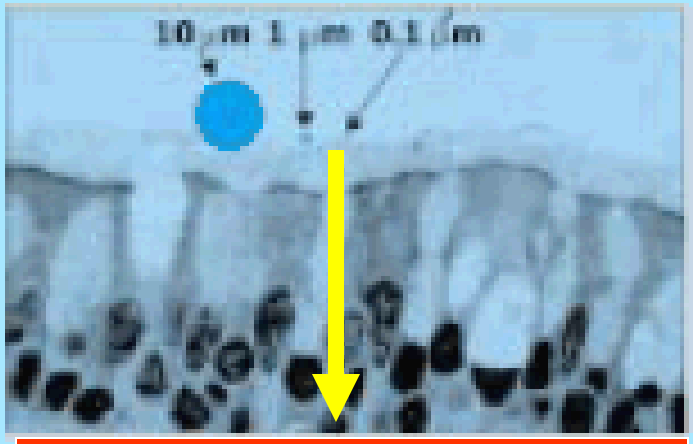
- Remain suspended for long periods of time
- Penetrate deep into the lungs

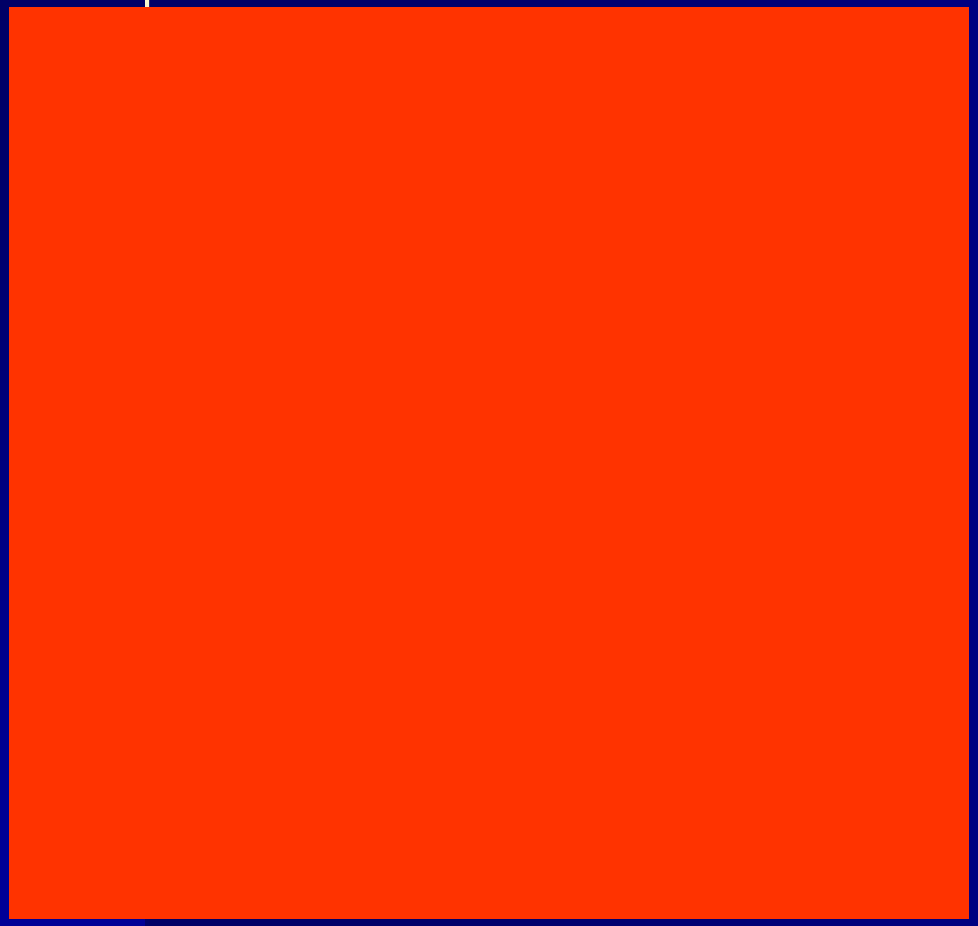


BLOOD

Nano particles are so small they can easily cross the lung membrane

Figure 1 Relation between ultrafine particles and cellular structures in the lung. Idealised particles of 10, 1, and 0.1 µm are shown compared with a bronchial epithelium; note that the top end of the range of ultrafine particles (0.1 µm, 100 nm) is not really visible. On the right are shown the same three particles relative to cilia.

Nano Pathology



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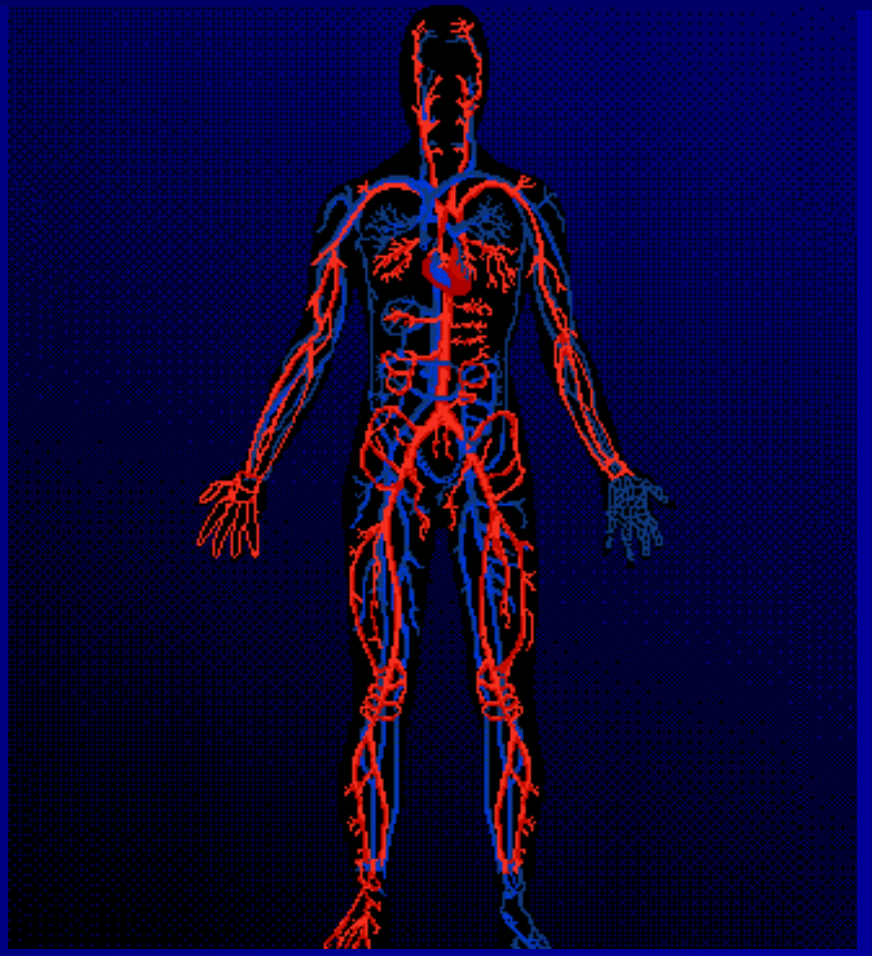

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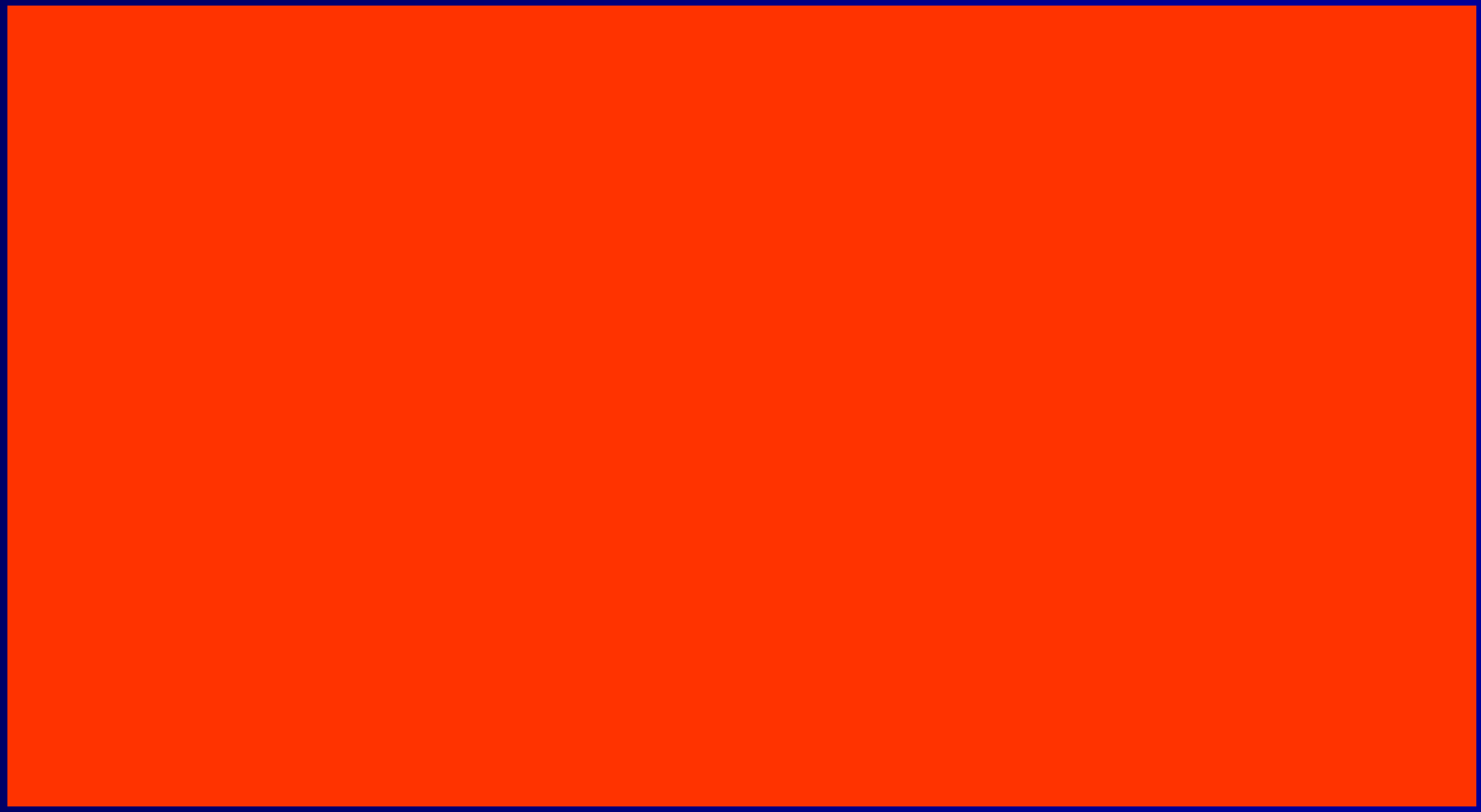
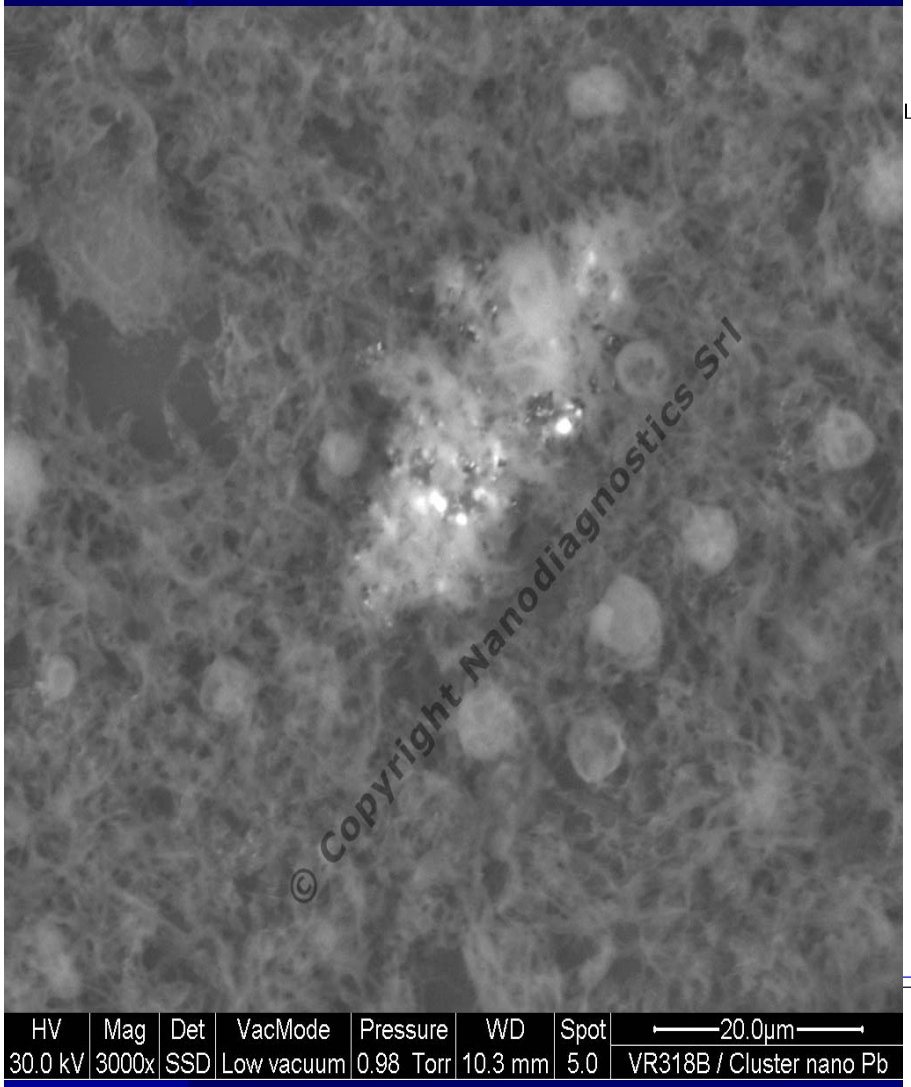
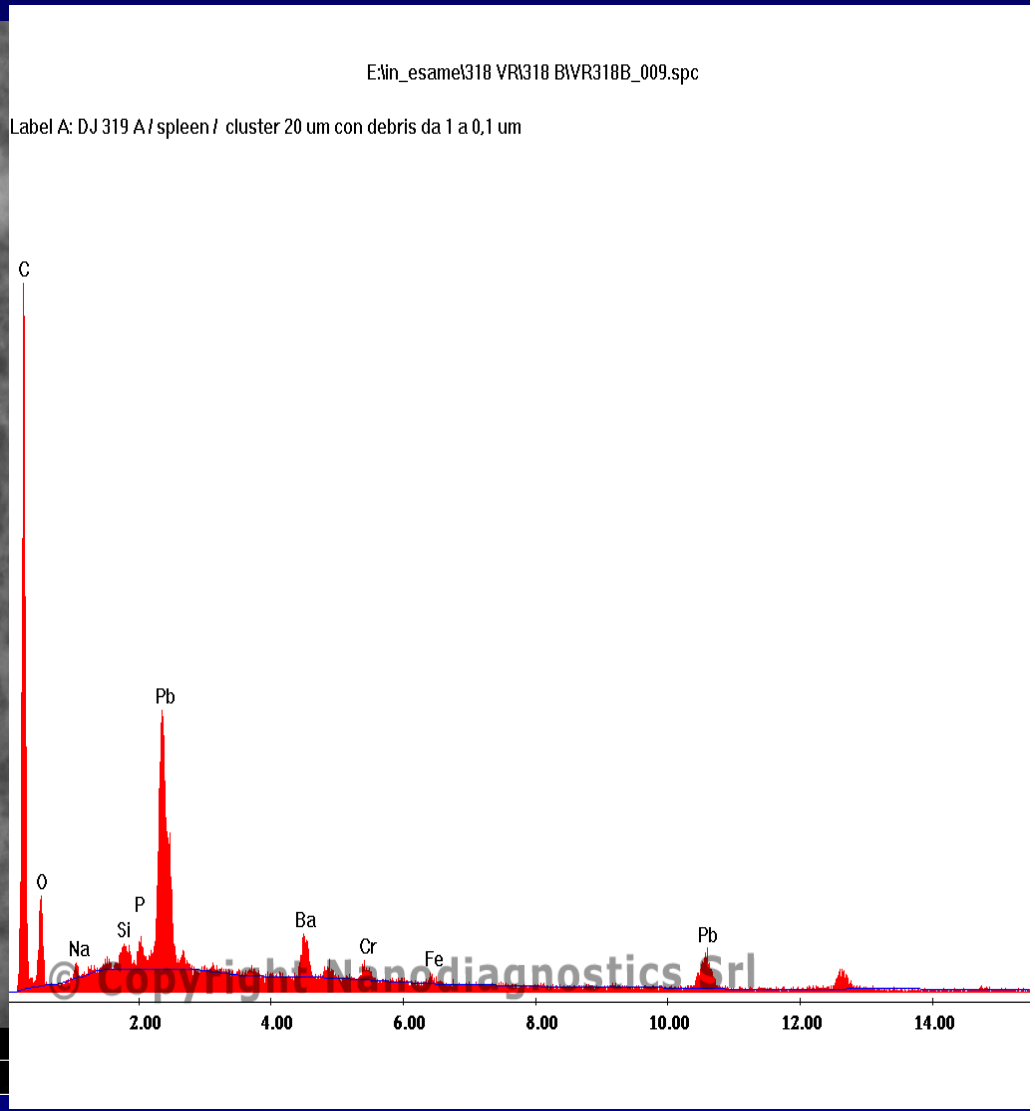


Nano Pathology

- They can even cross the blood brain barrier

Aggregati di Piombo, Bario, Cromo, Ferro **e** Silicio **in** Cervello**.**





www.stefanomontanari.net

Dioxins and Incineration (more detailed ppt available)

Dioxins - major concerns

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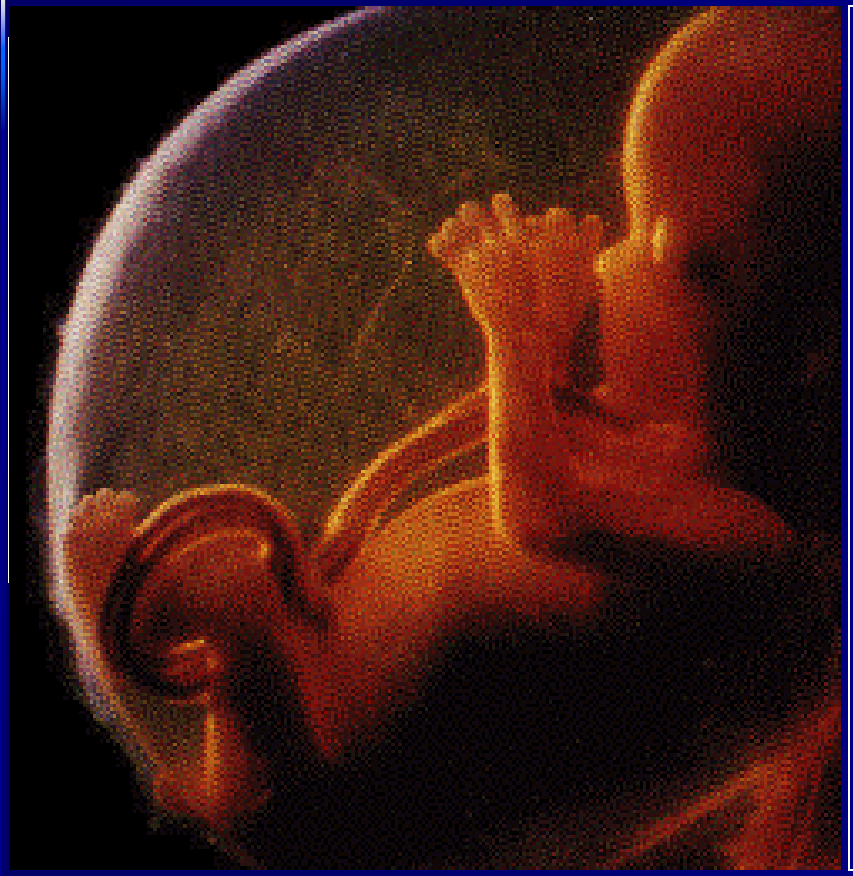
- **…by having a baby!**

Dioxins: the highest dose goes to the fetus



In nine months much of the dioxin which has accumulated in the mother's fat for 20-30 years goes to the fetus

Dioxins can disrupt fetal and infant development

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Dioxins interfere with fetal and infant development

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- **Linda S. Birnbaum (**Health Effects Research Laboratory, US EPA) Developmental Effects of Dioxins *Environmental Health Perspectives*, 103: 89-94, 1995

Our Stolen Future

How Man-made Chemicals are Threatening our Fertility, Intelligence and Survival

Theo Colborn
John Peterson Myers
Dianne Dumanoski
1994

Institute of Medicine, 2003

Dioxins and Dioxin-like Compounds in the Food Supply

Strategies to Decrease Exposure

July 1, 2003

Institute of Medicine, 2003

Institute of Medicine, 2003

- …The committee recommends that the government place a high public health priority on reducing DLC (dioxin like compounds) intakes by girls and young women in the years well before pregnancy is likely to occur.

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- (by) Substituting low-fat or skim milk, for whole milk, (and)… foods lower in animal fat…

Dioxins & Incineration (conclusions)

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- Incineration is an AVOIDABLE source of dioxin

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- Incinerators are so unpopular with the public they use different names - resource recovery facilities, waste-to-energy, thermal valorization etc etc
- The latest phase is to call them gasifiers, pyrolyzers, molecular dissociation, or plasma arc facilities

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- So the more appropriate name would be:
- Gasifying incinerator

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- Fichtner Consulting Engineers Ltd, Stockport, Cheshire, March, 2004

Lurgi letter

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- Letter (08-09-2003) to Fichter Consulting Engineers Ltd, Cheshire, UK

“Even if we made incineration safe we would never make it sensible.

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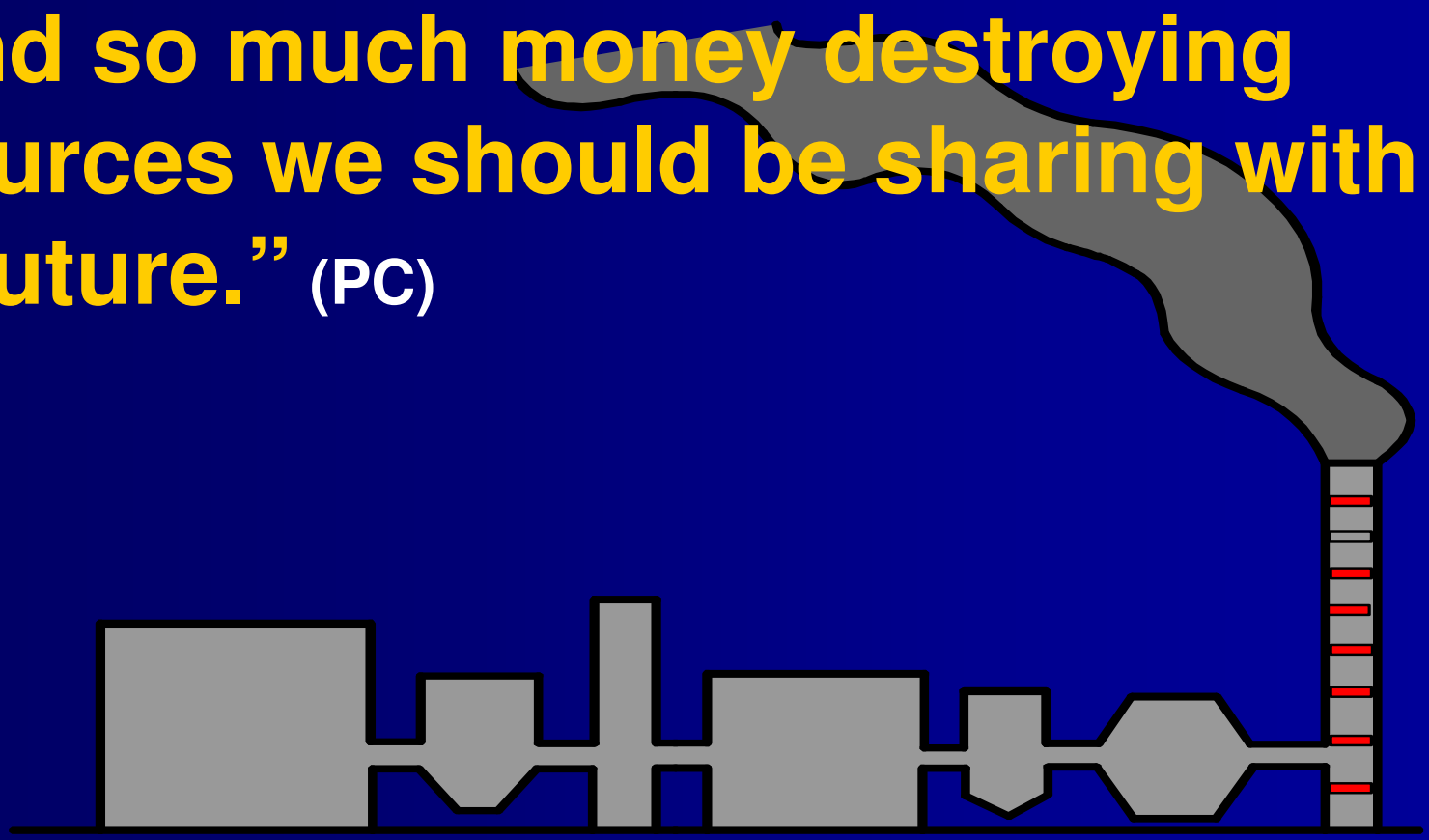
It simply does not make sense to spend so much money destroying resources we should be sharing with the future.” **(PC)**



The modern incinerator is attempting to perfect a bad idea

- At the industrial level our task in the 21st Century is not to find better ways to destroy discarded materials
- But to stop making packaging and products that have to be destroyed!
- And at the personal level to search for a lifestyle beyond consumerism

The Waste problem will not be solved with better technology

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- But with

The Waste problem will not be solved with better technology

- But with
- Better organization

The Waste problem will not be solved with better technology

- But with
- Better organization
- Better education

The Waste problem will not be solved with better technology

- But with
- Better organization
- Better education
- and better industrial design

3. The ZERO WASTE 2020 strategy

ZERO WASTE IS A NEW DIRECTION

THE BACK END OF WASTE MANAGEMENT

THE
BACK END
OF
WASTE
MANAGEMENT

THE
FRONT END
OF
RESOURCE
MANAGEMENT,
INDUSTRIAL
DESIGN
&
POST-CONSUMERISM

THE KEY

is to find a way to use

COMMUNITY RESPONSIBILITY

at the back end to drive

INDUSTRIAL RESPONSIBILITY

at the front end

Zero Waste can be approached with a series of simple steps

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- which are

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- which are
- Practical

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- which are
- Practical
- Cost effective and
- Politically acceptable

10 steps to Zero Waste

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1. Source Separation

10 steps to Zero Waste

1. Source Separation
2. Door-to-door Collection

10 steps to Zero Waste

1. Source Separation
2. Door-to-door Collection
3. Composting

10 steps to Zero Waste

1. Source Separation
2. Door-to-door Collection
3. Composting
4. Recycling

10 steps to Zero Waste

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2. Door-to-door Collection
3. Composting
4. Recycling
5. Re-use, repair & deconstruction

10 steps to Zero Waste

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6. Waste reduction initiatives

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7. Economic incentives

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8. Residual Separation and Research

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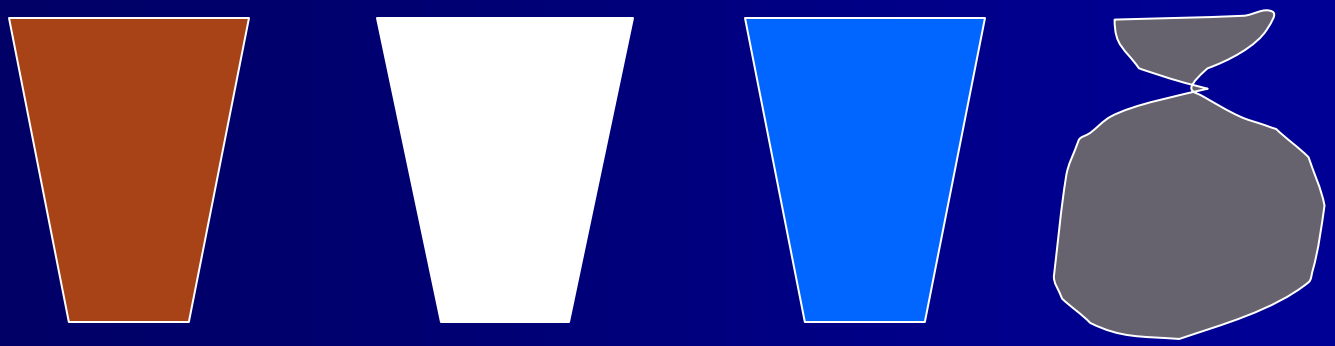
9. Better industrial design
10. Interim landfill for the stabilized "dirty" organic fraction.

1. Source Separation
&
2. Door-to-door collection

"The Fantastic 3"

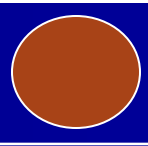
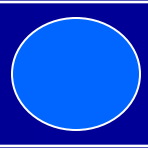
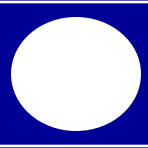
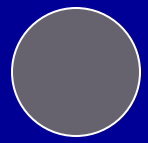
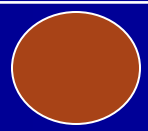
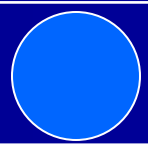
The San Francisco system

I “Fantastici 4”



Capannori, Italia

Capannori

LUNEDI	ORGANICO	
MARTEDI	MULTIMATERIALE	
MERCOLEDI	CARTA	
GIOVEDI	FRAZIONE RESIDUA	
VENERDI	ORGANICO	
SABATO	MULTIMATERIALE	

3. Composting

Organic Fraction heirarchy

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6) Centralized composting facility.

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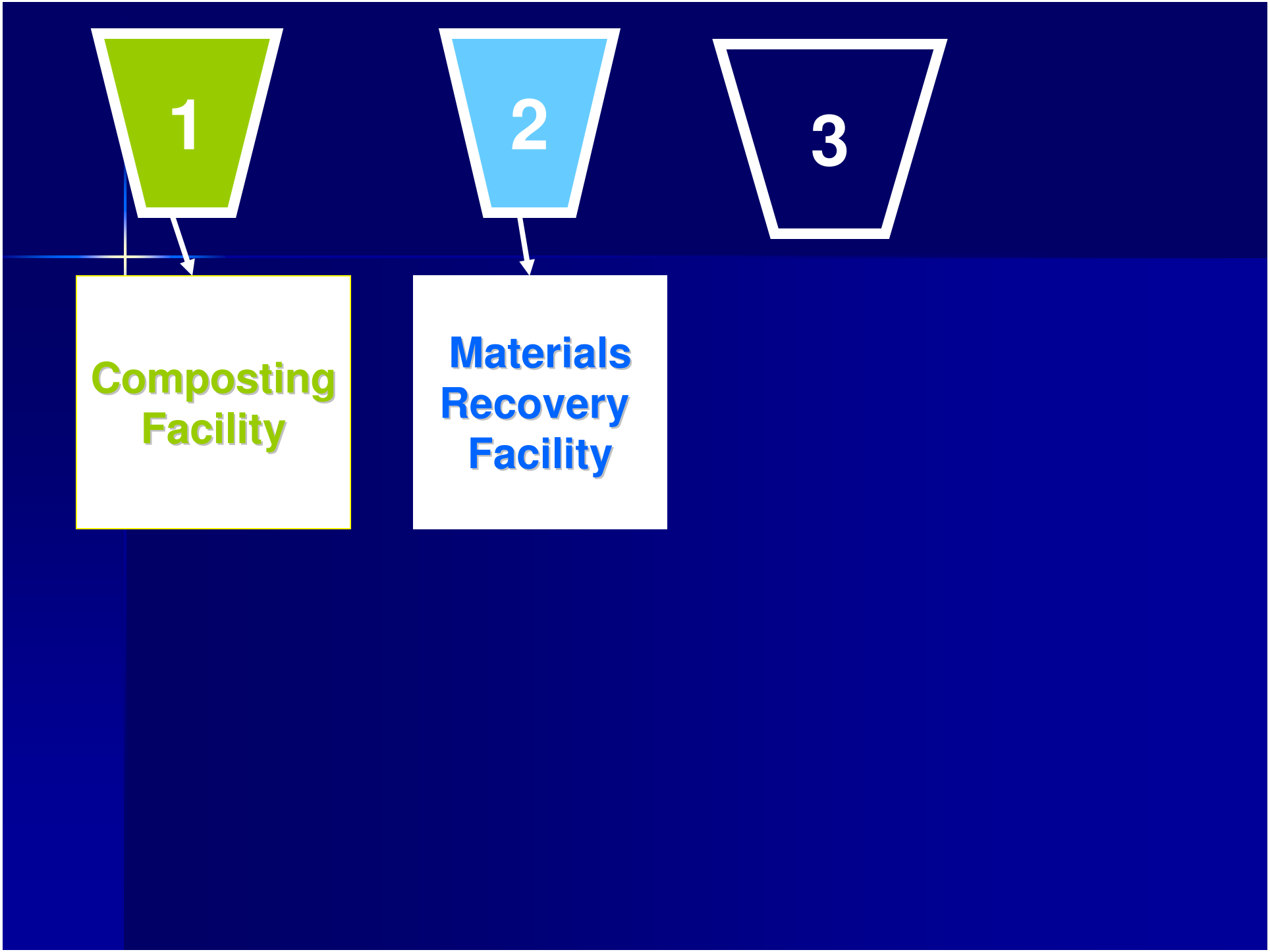
4) Makes it easier for cities to handle the recyclables (jobs and businesses!)
5) But to use compost in agriculture you MUST have it clean – which means you MUST have DOOR-TO-DOOR collection.


1
2
3
Composting Facility

Composting plant for San Francisco

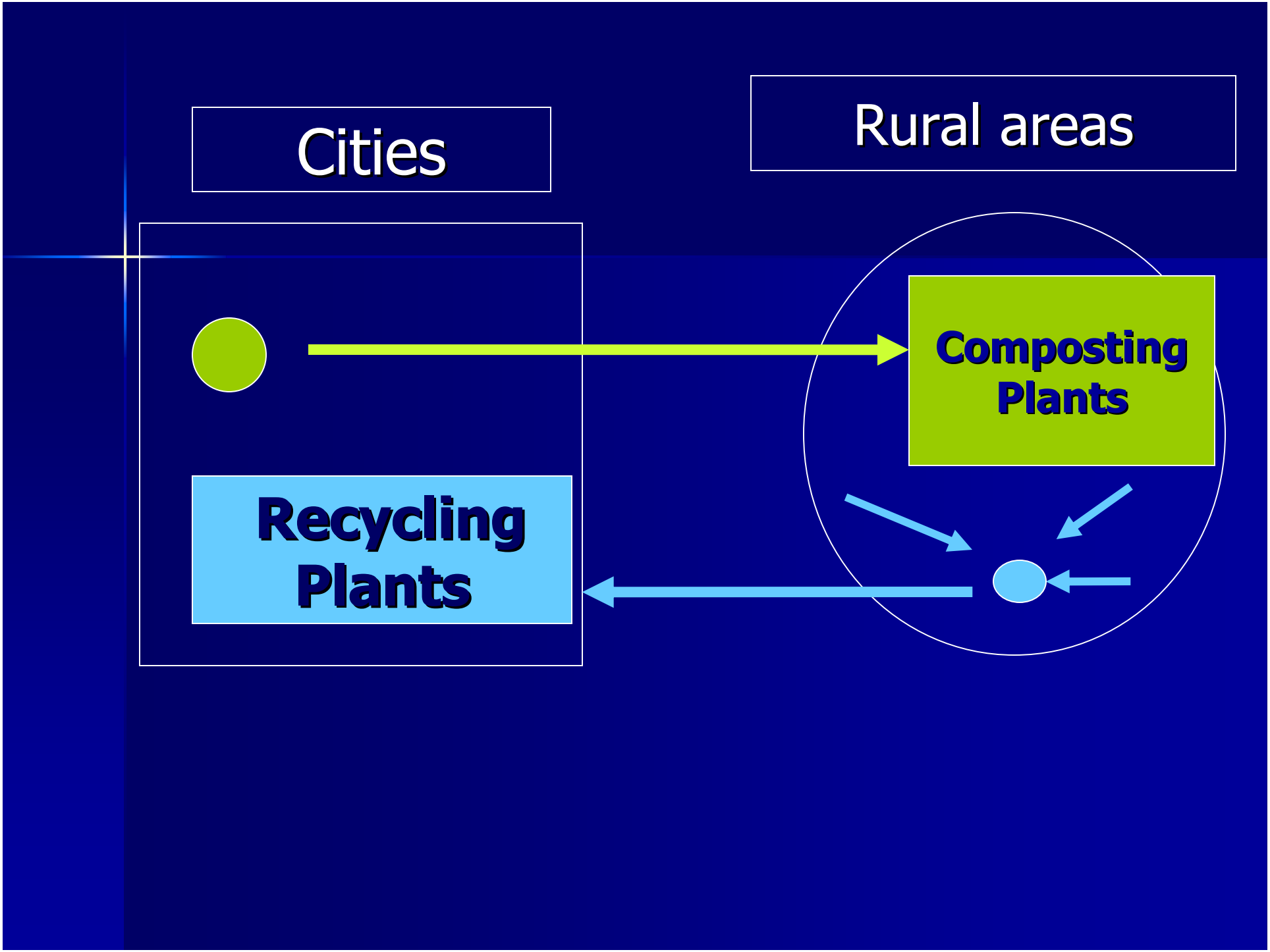
Local farmers are using the compost to grow fruit and vegetables for San Francisco

4. Recycling


1
2
3
Composting Facility
Materials Recovery Facility

MATERIALS RECOVERY FACIILITY

at Pier 96


Cities
Rural areas
Composting Plants
Recycling Plants

5. Reuse, Repair & Deconstruction

Value of Los Angeles discarded materials

Market Categories	%	Tons/Year	$/ton	$
1.Reuse **Reusable items**	**2.0**	**72,000**	**550**	**39,600,000**
2.Paper	**[illegible]**	**792,000**	**20**	**15,840,000**
3.Plant Debris	**5.5**	**198,000**	**7**	**1,386,000**
4.Putrescibles	**17.0**	**612,000**	**7**	**4,284,000**
5.Wood	**4.0**	**144,000**	**8**	**1,152,000**
6.Ceramics	**13.0**	**468,000**	**4**	**1,872,000**
7.Soils	**10.0**	**360,000**	**7**	**2,520,000**
8.Metals	**4.0**	**144,000**	**40**	**5,760,000**
9.Glass	**2.0**	**72,000**	**10**	**720,000**
10.Polymers	**8.0**	**288,000**	**100**	**28,800,000**
11.Textiles	**2.0**	**72,000**	**20**	**1,440,000**
12.Chemicals	**0.5**	**18,000**	**15**	**270,000**
No market (diapers, treated wood, mistakes)	**10.0**	**360,000**		**0**
TOTAL PER YEAR	100	3,600,000		$103,644,000

Reuse, Repair & Deconstruction

Urban Ore, Berkeley, California

- Urban Ore operating for 30 years

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- Grossing $3 million per year

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- 27 full-time well-paid jobs

Economics

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Economics

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- The Zero Waste strategy represents 100's of LITTLE GREEN BOXES"

Economics

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- (Ted Ward, Zero Waste, Del Norte County, California)

Deconstruction

Deconstruction

Reuse &
Repair Center

Deconstruction

Reuse &
Repair Center

Furniture,
Flooring, etc

VIDEOS

VIDEOS

- www.AmericanHealthStudies.org

VIDEOS

- www.AmericanHealthStudies.org
- Examples of Reuse and Repair Centers from California, Vermont, Nova Scotia and Australia

Reuse and Repair Centers

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Can be used for:

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Can be used for:

1. Poverty relief

Reuse and Repair Centers

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2. Job training (Burlington, Vermont, see video)

Reuse and Repair Centers

Can be used for:

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2. Job training (Burlington, Vermont, see video)
3. Community building (recreate the village within the city)

San Francisco

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- GOAL:100% by 2020 (or very close!)

Please Note

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Mass burn incineration only gets 75% diversion from landfill.

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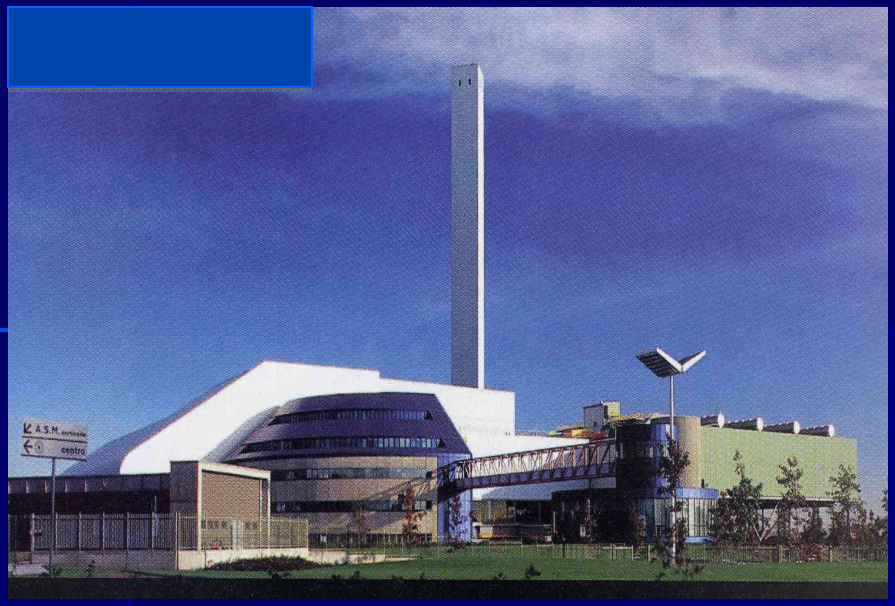
For every 4 Tons of waste burned you get at least 1 Ton of Toxic Ash.

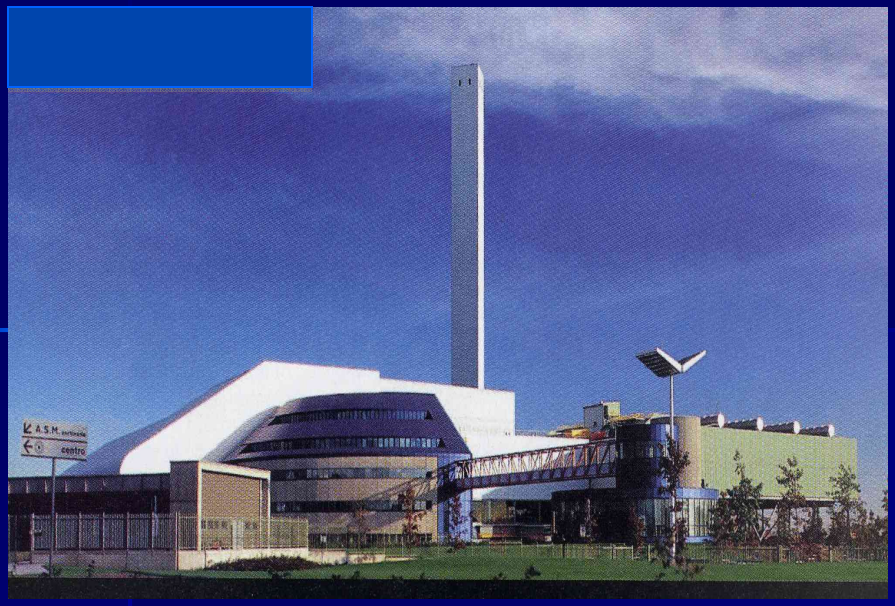


Brescia

75% reduction

San Francisco

72% reduction

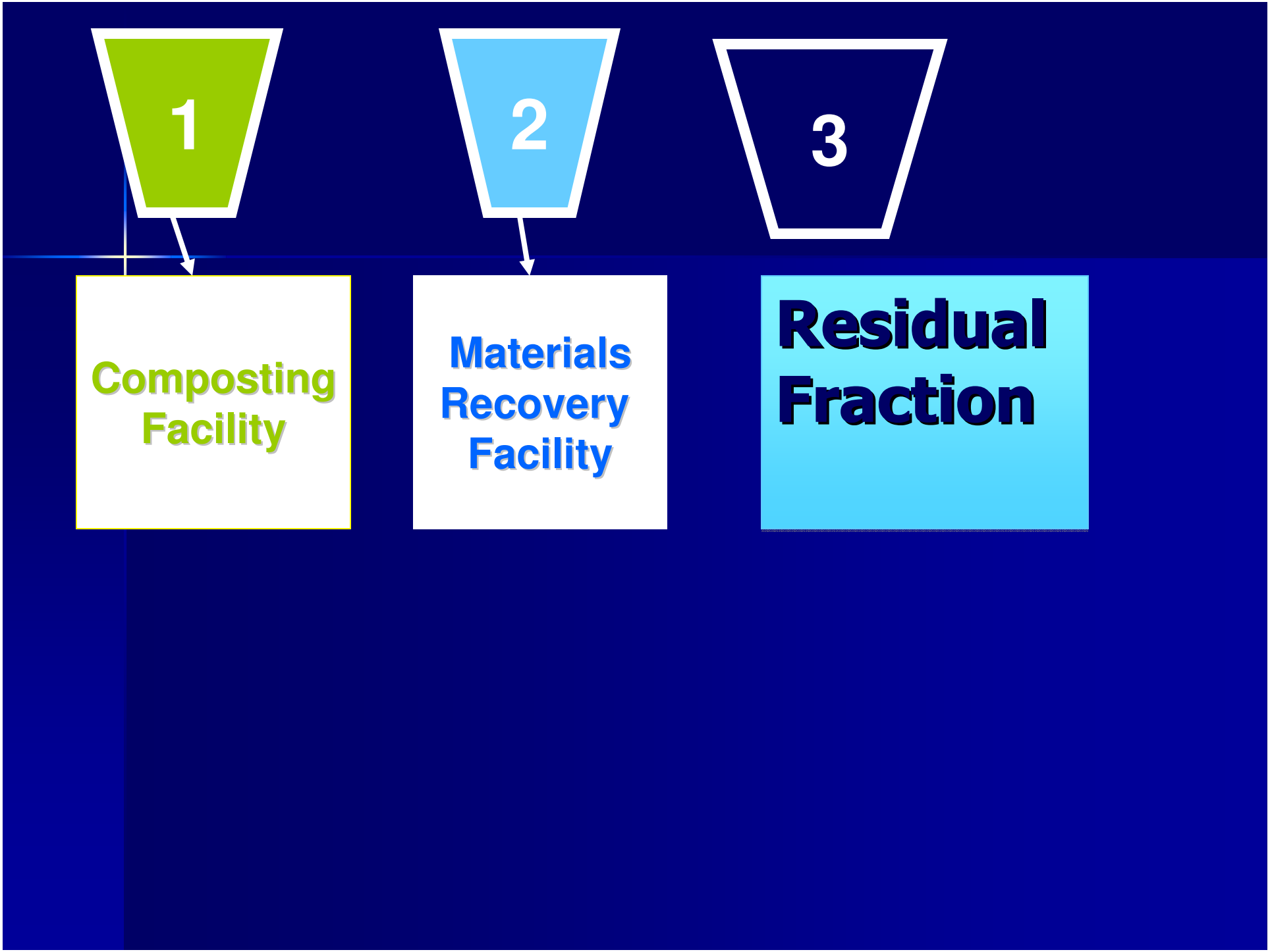


Brescia

75% reduction
25% toxic ash

San Francisco

72% reduction
28% residuals


1
2
3
Composting Facility
Materials Recovery Facility
Residual Fraction

We have to minimize the residual fraction with…

We have to minimize the residual fraction with…

1) Waste reduction initiatives

We have to minimize the residual fraction with…

1) Waste reduction initiatives
2) Economic incentives

Undesirable packaging

Undesirable packaging

- Four options:

Undesirable packaging

- Four options:
- Ban it

Undesirable packaging

- Four options:
- Ban it
- Tax it

Undesirable packaging

- Four options:
- Ban it
- Tax it
- Put a returnable deposit on it

Undesirable packaging

- Four options:
- Ban it
- Tax it
- Put a returnable deposit on it
- Avoid it