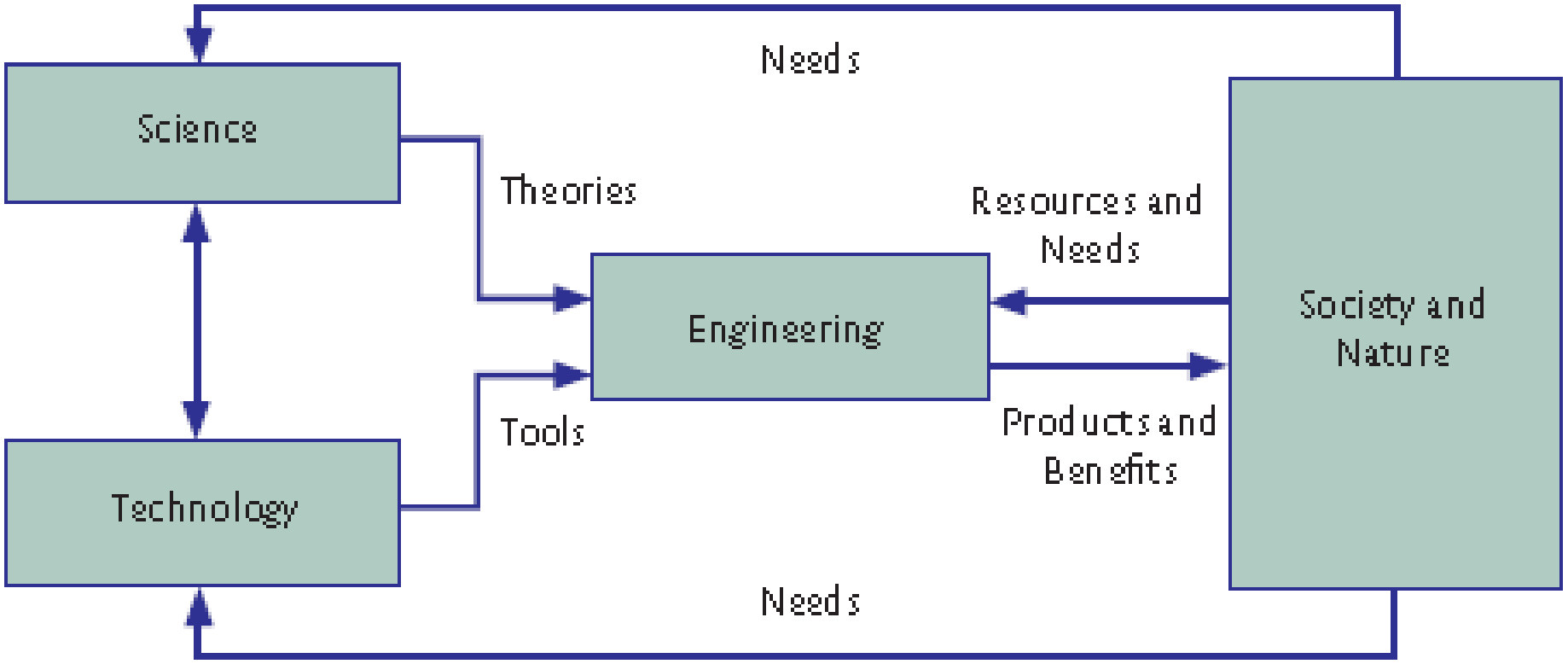
CH –VI **Contemporary Issues in Engineering**

1. **Globalization and Cross Cultural Issues**
2. **Public Private Partnership**
3. **Safety, Risk and Benefit Analysis**
4. **Development and Environment**
5. **Conflict and Dispute Management**

What is an engineering ?



What is an engineering ?

- **Engineering is the field or discipline, practice, profession and art that relates to the development, acquisition and application of technical, scientific and mathematical knowledge about the understanding, design, development, invention, innovation and use of materials, machines, structures, systems and processes for specific purposes. There are of course many definitions.**
- **The term 'engineering' derives from the word 'engineer' used in the 1300s for a person who operated a military engine or machine – such as a catapult or, later, a cannon.**
- **The word 'engine' in turn derives from the Latin *ingenium for ingenuity* or cleverness and invention.**
- **The terms 'art' and 'technical' are important because engineering also arranges elements in a way that may, or may not, appeal to human senses or emotions, and relates also to the Greek *technikos relating to art, craft, skill* and practical knowledge and language regarding a mechanical or scientific subject.**
- **Prior to the development of the different fields of engineering, engineering and 'technical' were originally closely connected,.**
- **The military connotation declined giving way to civil engineering, mechanical, chemical, electrical and electronic and later, fields that continue to develop with the development of knowledge (apart from some curious exceptions such as the Army Corps of Engineers in the USA).**

Contemporary issues

- **Many engineering faculty members struggle with ways to thoroughly integrate the consideration of contemporary issues and the connection between engineering and global or societal impacts into traditional engineering curricula. two methods have been used in senior technical elective level engineering courses, and involve either the development of a comprehensive public policy for future engineering activities or the critical analysis of proposed legislation or policies that impact engineering. In performing their projects, students need to consider environmental, economic, public perception, and safety when appropriate. The students also gain an appreciation of what they will be able to do with the knowledge they have acquired in school.**

"Grand Challenges,"

- President Barack Obama greets science, technology, engineering, and math (STEM) leaders including National Academy of Engineering President C. D. Mote Jr. during the 2015 White House Science Fair, in the Map Room of the White House, March 23, 2015. (Official White House Photo by Pete Souza). In a letter of commitment presented to President Barack Obama , more than 120 U.S. engineering schools announced plans to educate a new generation of engineers expressly equipped to tackle some of the most pressing issues facing society in the 21st century.

- These "Grand Challenges," identified through initiatives such as the White House Strategy for American Innovation, the National Academy of Engineering (NAE) Grand Challenges for Engineering, and the United Nations Millennium Development Goals,
- include complex yet critical goals such as engineering better medicines, making solar energy cost-competitive with coal, securing cyberspace, and advancing personalized learning tools to deliver better education to more individuals.

Challenges

An engineering student tackles dirty water

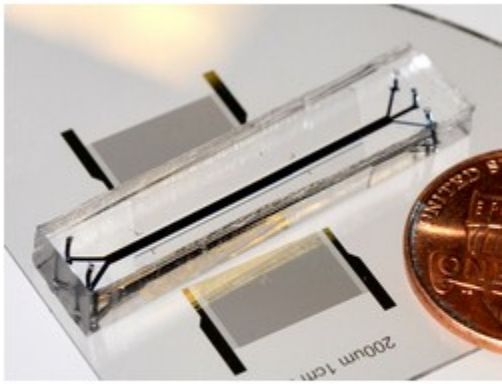
POSTED APRIL 16, 2015 AT 10:37 AM

HTTPS://NEWS.NCSU.EDU/2015/04/ROG...

Using sound to separate cancer cells from blood samples

POSTED APRIL 15, 2015 AT 2:53 PM

HTTP://NEWS.PSU.EDU/STORY/351700/2...



An acoustic tweezer device about the size of two pennies has two sound transducers and a channel for separation. Image: ...

This bending bolt could help buildings withstand earthquakes

POSTED APRIL 15, 2015 AT 1:22 PM

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Some Engineering issues

Make Solar Energy Economical

Provide Energy from Fusion

Develop Carbon Sequestration Methods

Manage the Nitrogen Cycle

Provide Access to Clean Water

Restore and Improve Urban Infrastructure

Advance Health Informatics

Engineer Better Medicines

Reverse-Engineer the Brain

Prevent Nuclear Terror

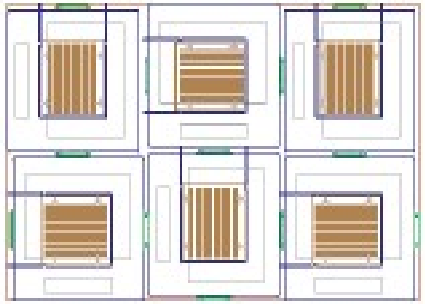
Secure Cyberspace

Enhance Virtual Reality

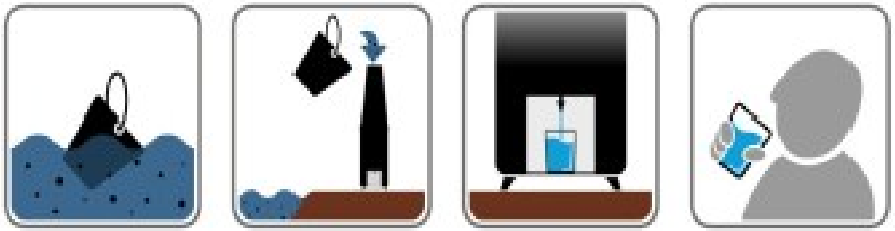
Advance Personalized Learning

Engineer the Tools of Scientific Discovery

Filling The Gap: „The Water Backpack“



The Whole „Manual“:



An engineer

- **People who are qualified in or practice engineering are described as engineers, and may be licensed and formally designated as professional, chartered or incorporated engineers. As noted above, the broad discipline of engineering includes a range of specialized disciplines or fields of application and particular areas of technology. Engineering itself is also differentiated into engineering science and different areas of professional practice and levels of activity. The engineering profession, as with other professions, is a vocation or occupation based upon specialized education and training, as providers of professional advice and services. Other features that define occupations as professions are the establishment of training and university schools and departments, national and international organizations, accreditation and licensing, ethics and codes of professional practice. Surveying is closely professionally connected to engineering, especially civil engineering, and it is interesting to note that George Washington, Th omas Jefferson and Abraham Lincoln were all surveyors before going into politics.**

Challenge of engineering

- **develop public and policy awareness and understanding of engineering, affirming the role of engineering as the driver of innovation, social and economic development;**
- **develop information on engineering, highlighting the urgent need for better statistics and indicators on engineering (such as how many and what types of engineers a country has and needs – which was beyond the scope of this Report);**
- **transform engineering education, curricula and teaching methods to emphasize relevance and a problem-solving approach to engineering;**
- **more effectively innovate and apply engineering and technology to global issues and challenges such as poverty reduction,**
- **sustainable development and climate change – and urgently develop greener engineering and lower carbon technology.**

proposed new technology should include

- **What are alternative ways to accomplish the same ends? What advantages and disadvantages are there to the alternatives? What trade-offs would be necessary between positive and negative side effects of each?**
- **Who are the main beneficiaries? Who will receive few or no benefits? Who will suffer as a result of the proposed new technology? How long will the benefits last? Will the technology have other applications? Whom will they benefit?**
- **What will the proposed new technology cost to build and operate? How does that compare to the cost of alternatives? Will people other than the beneficiaries have to bear the costs? Who should underwrite the development costs of a proposed new technology? How will the costs change over time? What will the social costs be?**

proposed new technology should include

- **What risks are associated with the proposed new technology? What risks are associated with not using it? Who will be in greatest danger? What risk will the technology present to other species of life and to the environment? In the worst possible case, what trouble could it cause? Who would be held responsible? How could the trouble be undone or limited?**
- **What people, materials, tools, knowledge, and know-how will be needed to build, install, and operate the proposed new technology? Are they available? If not, how will they be obtained, and from where? What energy sources will be needed for construction or manufacture, and also for operation? What resources will be needed to maintain, update, and repair the new technology?**

proposed new technology should include

- **What will be done to dispose safely of the new technology's waste materials?**
- **As it becomes obsolete or worn out, how will it be replaced?**
- **And finally, what will become of the material of which it was made and the people whose jobs depended on it?**

ethical, social, economic and scientific considerations

- whether certain hazards should be entertained at all;
- how to maximise benefits to society through taking account of advances in scientific
- knowledge and technology while ensuring that undue burdens with adverse
- economic and social impact or consequences are not imposed on the regulated;
- how to achieve the necessary trade-offs between benefits to society and ensuring that individuals are adequately protected;
- the need to avoid the imposition of unnecessary restrictions on the freedom of the individual.
- REDUCING RISKS, PROTECTING PEOPLE
- decision-making process

Risk/ benefit consideration in public transportation

- Safety (accidents)
- Pollution (use of fossils fuels , lubricants, maintenance and repair)
- Losses of useful land etc
- Environment and ecological impact
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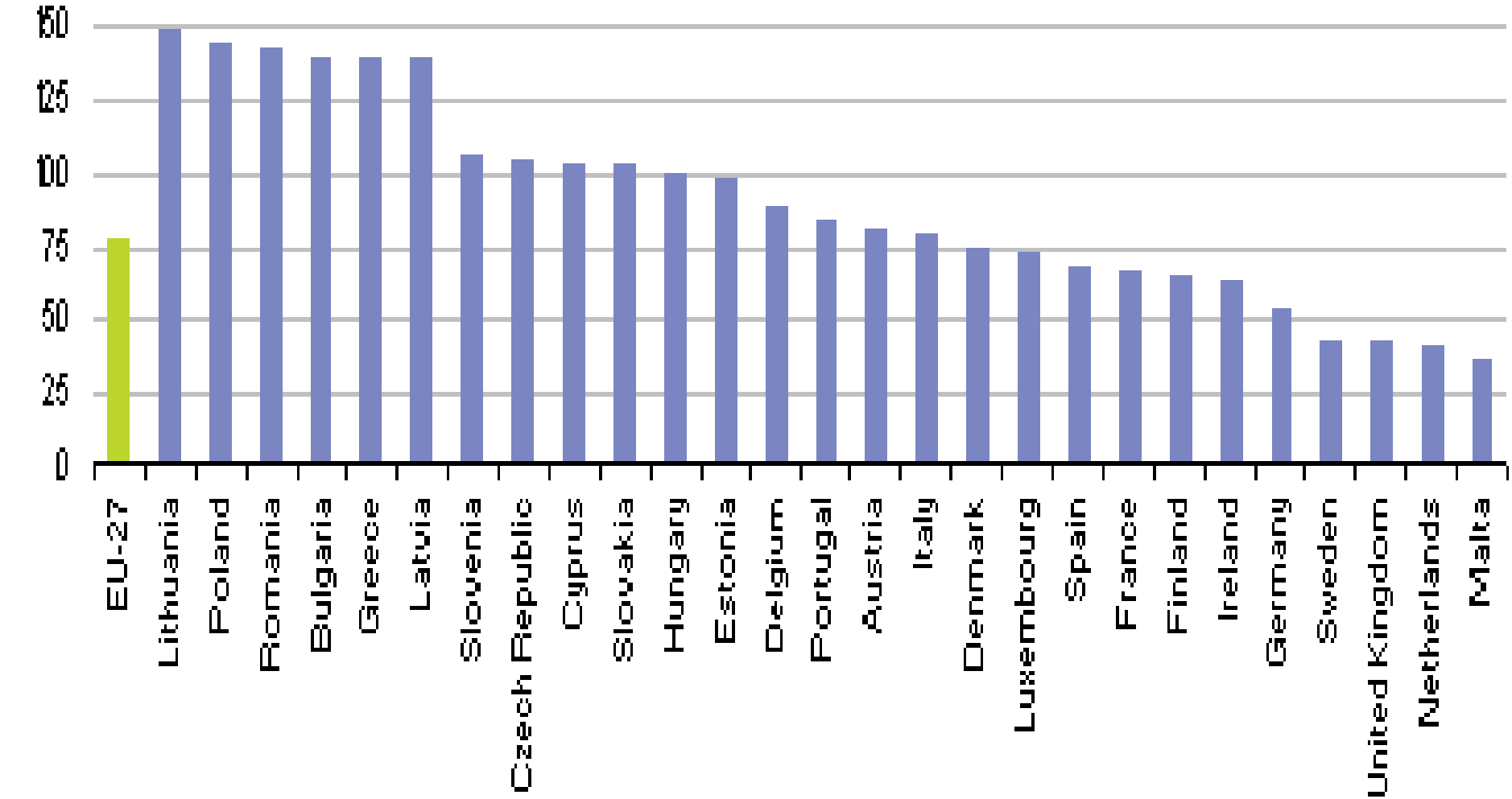
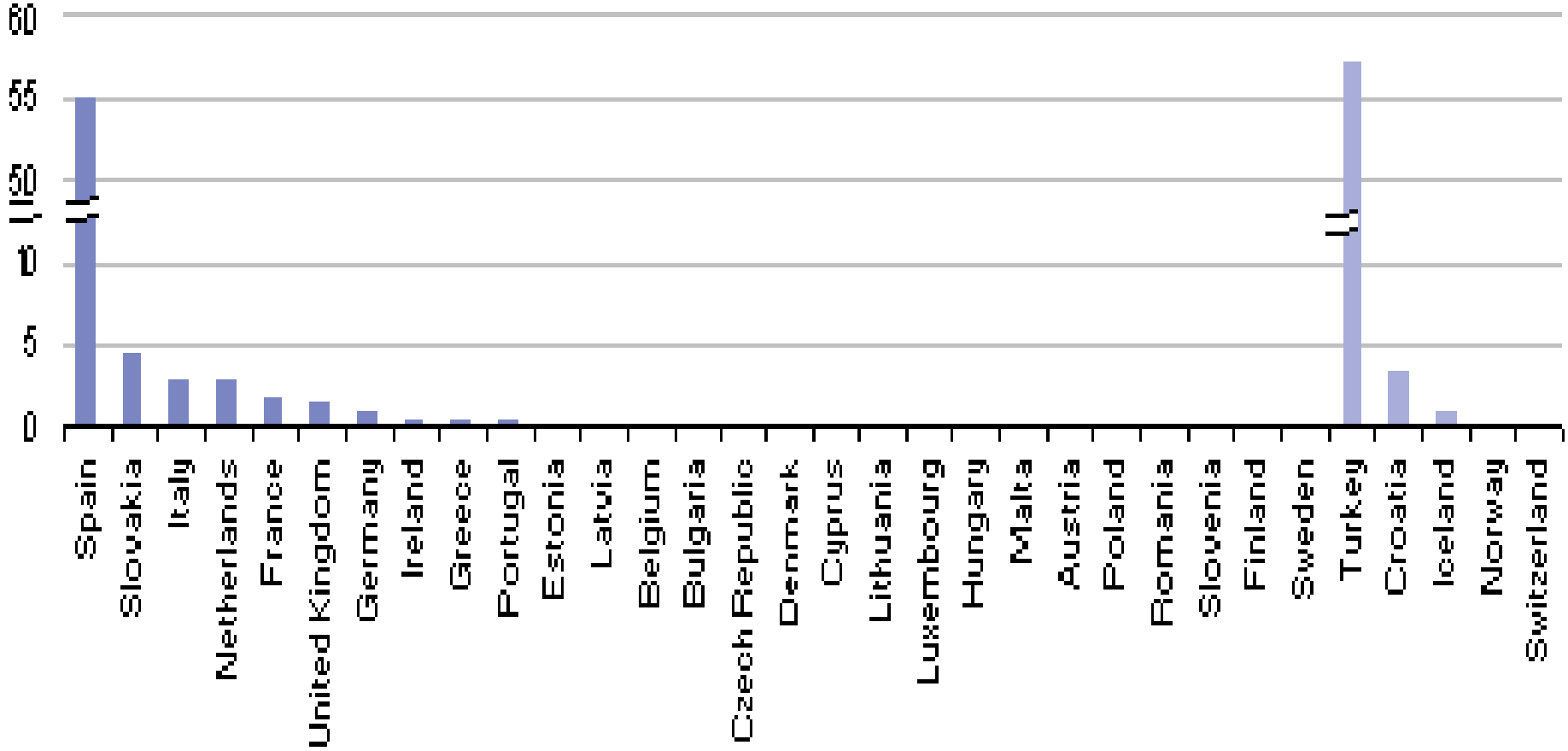


Source: Eurostat (online data code: tsdtr420),

European Commission CARE database (Community Database on Road Accidents)

	Total	Passengers	Railway employees	Others
Total	1 428	37	36	1 353
Collisions (excluding level-crossing accidents)	10	0	4	6
Derailments	32	0	2	30
Accidents involving level-crossings	433	2	5	426
Accidents to persons caused by rolling stock in motion	942	34	23	883
Fire in rolling stock	0	0	0	0
Others	11	1	2	8

Source: Eurostat (online data code: rail_ac_catvict)



(1) Accidents on national territory regardless of the nationality of the aircraft operator; Germany, Norway, Switzerland and Turkey, 2007 only; Croatia, average 2008-2009; Iceland, average 2007-2008.

Source: Eurostat (online data code: avia_ac_fatal)

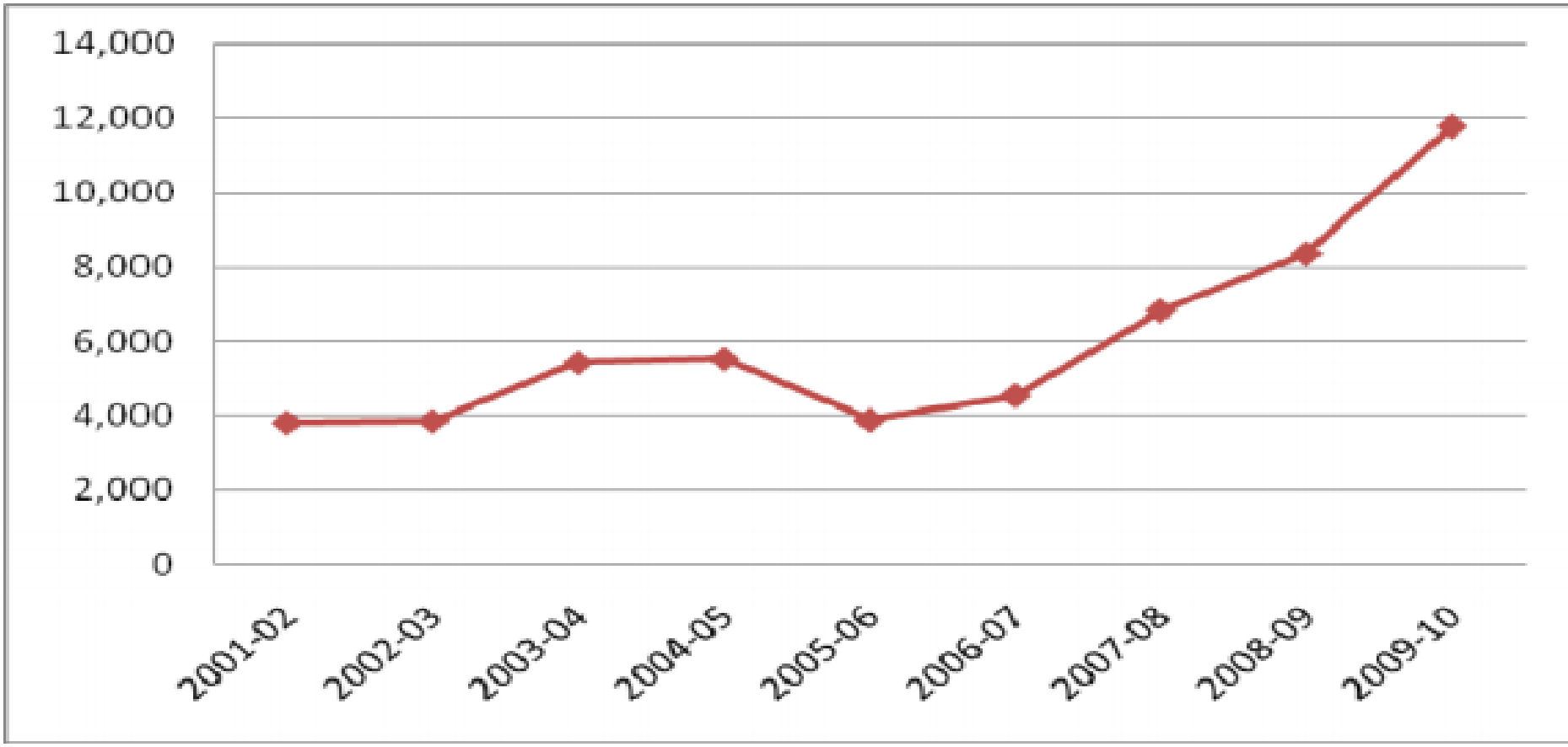
Table3: Growth in the Overall Road Network, 1975-2007 (km)

	Highways	Feeder Roads	Urban Roads	District Roads	Total
1985	1,960	1,875	866	1,224	5,925
1990	2,111	1,822	1,098	2,299	7,330
1994	2,734	1,520	1,339	3,941	9,534
1998	2,905	1,835	1,868	6,615	13,223
2002	3,029	1,832	2,198	9,775	16,834
2004	3,339	4,196	2,260	7,486	17,281
2006/07	4,198	5,201	2,260	7,223	18,828
2009/10	4718	6117	2473	6956	20264

Note: *2009/10 data include the re-designation of some District Roads as part of SRN (NH&FR)

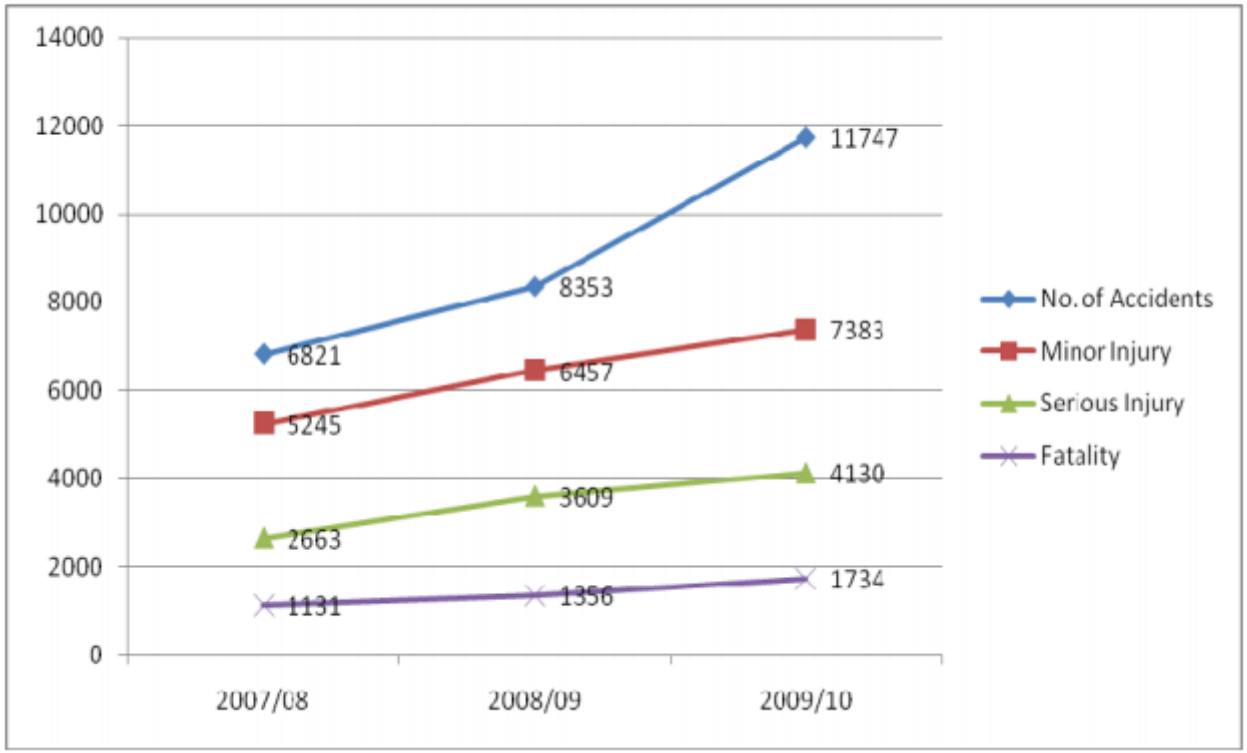
Source: DoR Road Statistics, 2009/10

Figure :2- Number of road accidents 2001-2009



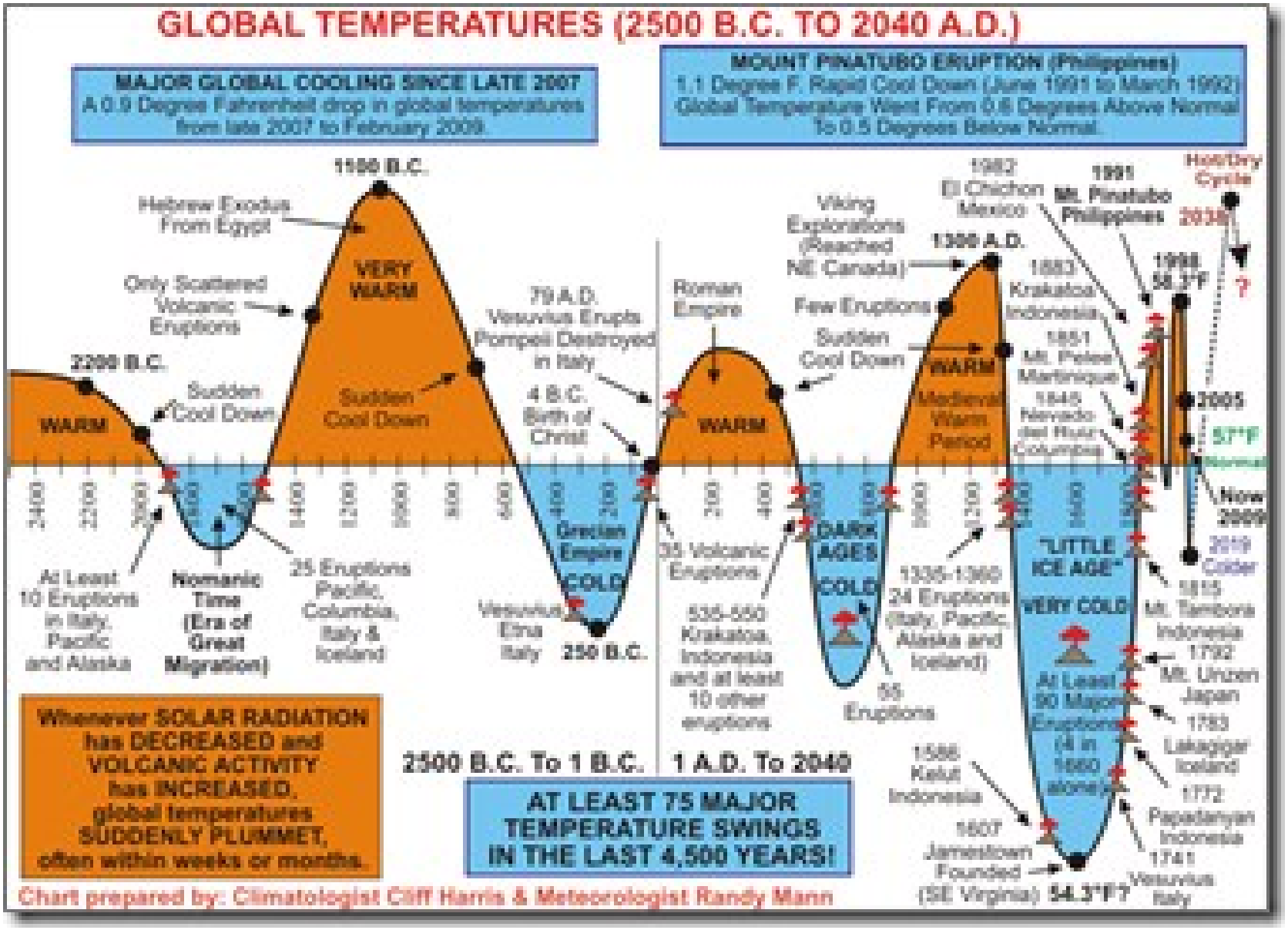
Trend of accident

Figure: 1- Trend of Accident, Minor Injury, Serious Injury and Fatality



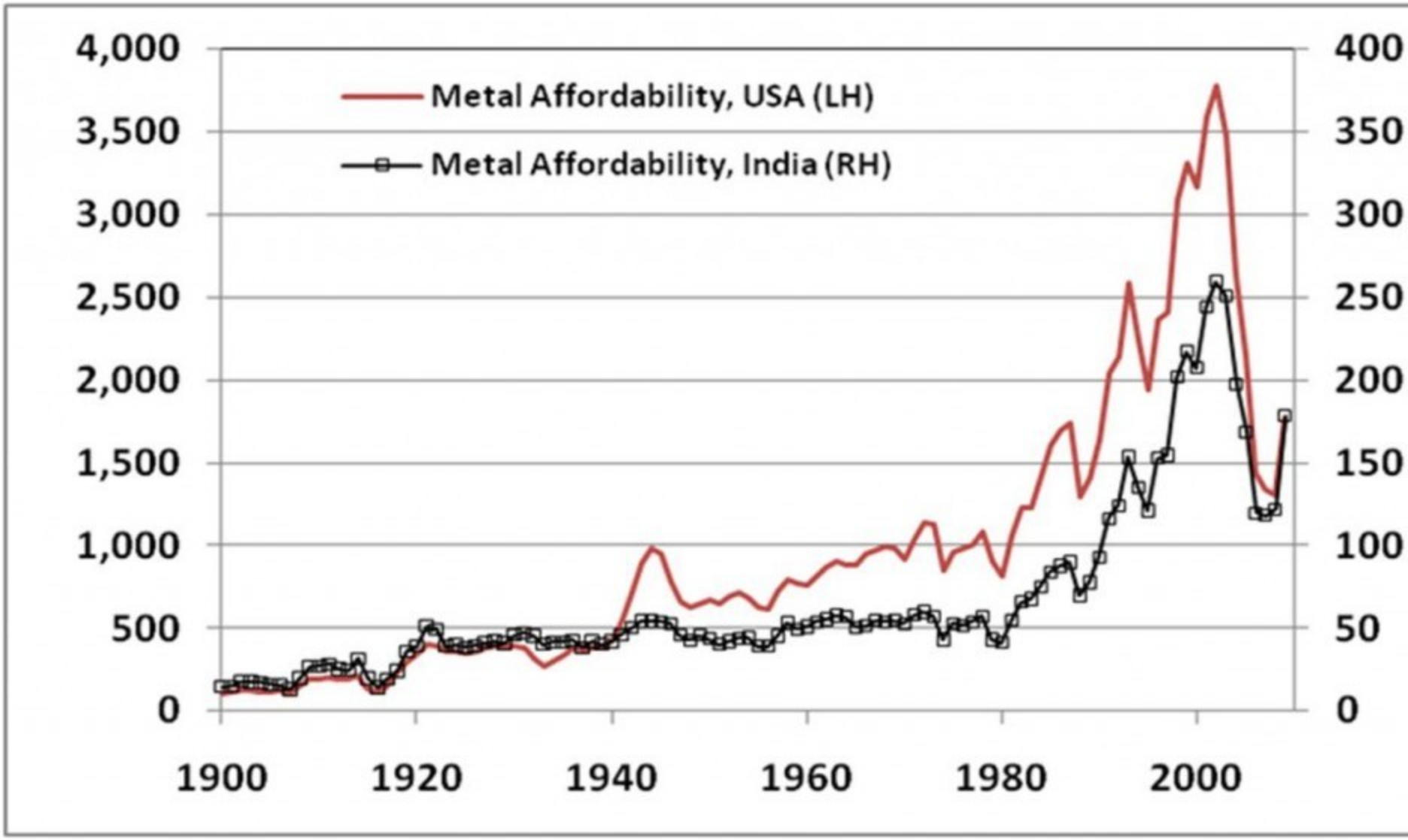
Development
Industrialization vs. protection of the environment

Industrialization vs. protection of the environment



Industrialization vs. protection of the environment

Industrialization vs. protection of the environment



Industrialization vs. protection of the environment

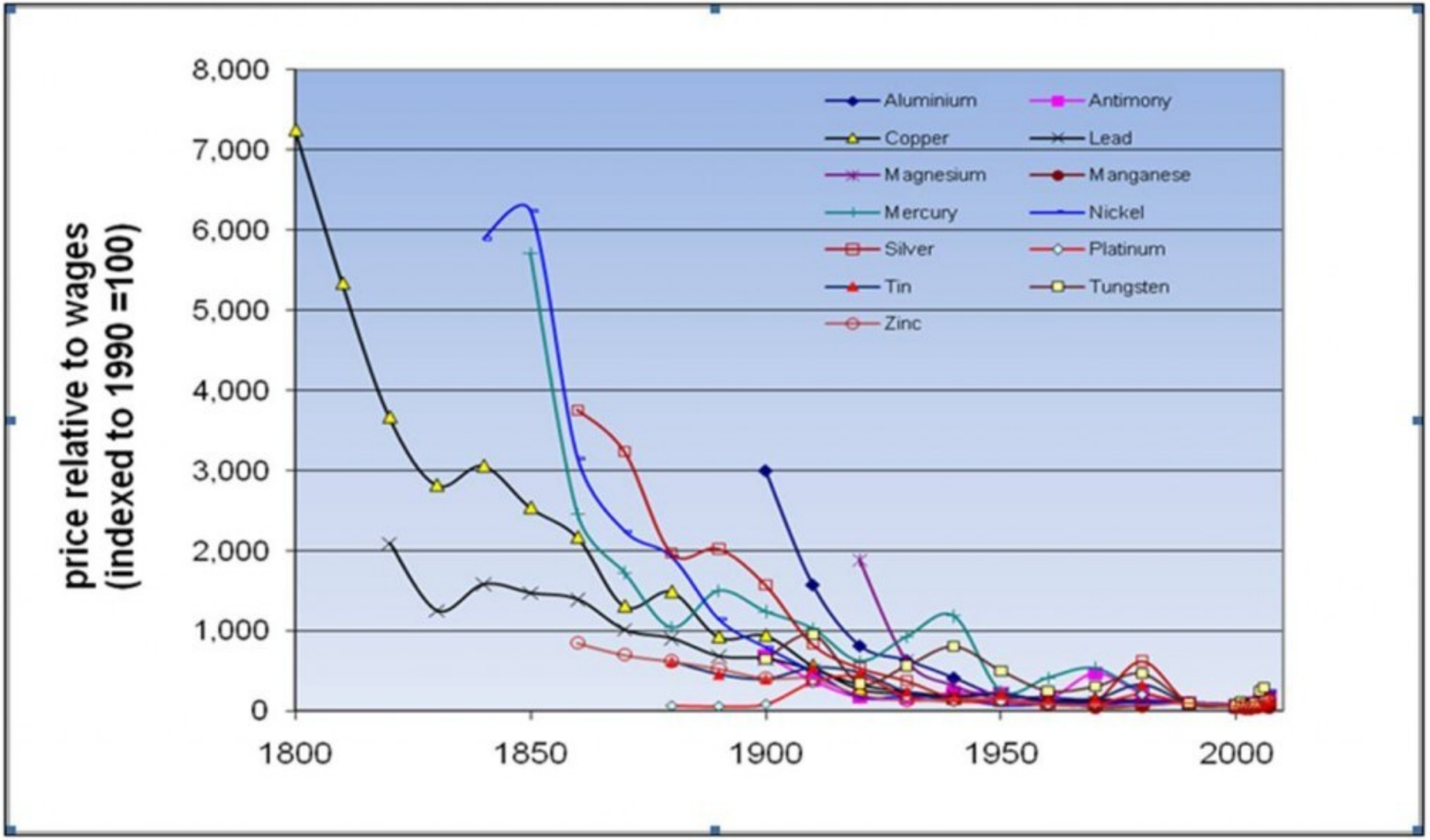
Despite the price run up in the past decade, and notwithstanding the massive increase in demand from larger and wealthier populations, metals are more affordable now than they were for most of the past century.

· There has been a general increase in affordability in both the US (left hand scale) and India (right hand scale).

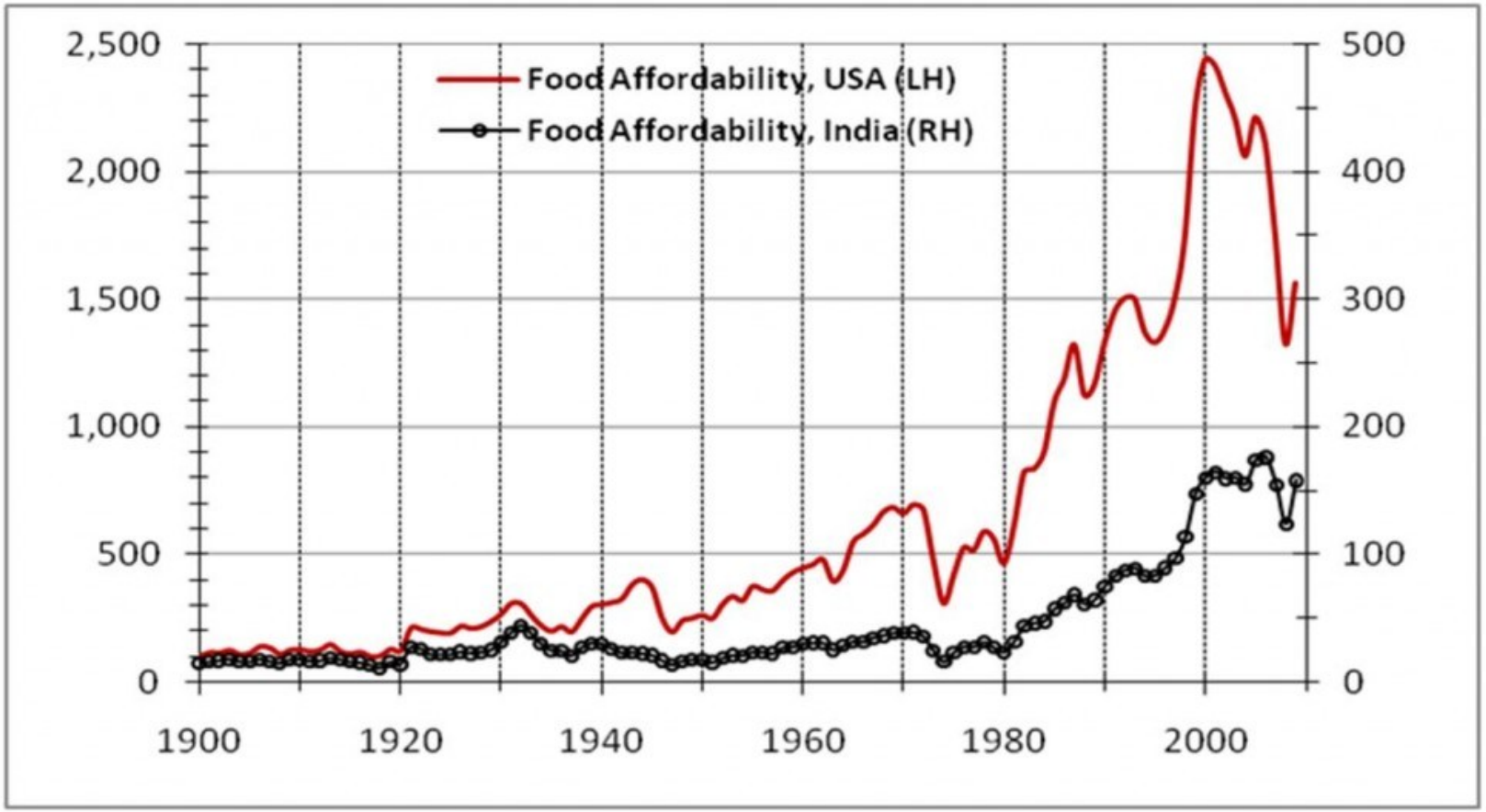
· Metals affordability is 10 times higher for the US currently than it is for India. This spread is about the same as it was in 1900.

· Metals affordability increased by more than an order of magnitude since 1900 in both the US and India.

Industrialization vs. protection of the environment



Food affordability



Industrialization vs. protection of the environment

- Industrialization in the name of growth
- loaded tremendous pressure on environment. Industrialization & environment in the developing countries tries to run hand to hand.
- But knowingly or unknowingly, industrialization ran faster without caring for environment to win the race.
- The pace of industrialization has increased several fold in last decade.
- Rapid industrialization to meet the public need has detoriated the environment to its fullest extent during lseveral decade.
- Industrial effluents, polluted air, noise pollution, Green House gas effect etc not only a concern for human habitat but also a concern for the forthcoming disasters.
- In order to lead a healthy life we are detoriating the environment in shadow.

Industrialization vs. protection of the environment

- Human comfort in one form for short duration causes discomfort in long run.
- Of the late industries as well as human being at individual understood the basics & now concentrated on long run & durability.
- As described above, World over, the industries are becoming increasingly concerned about achieving and demonstrating their environmental performance because of the growing compulsions from tough legislations and mounting public pressures.
- Environmental disasters such as Bhopal tragedy, Rhine pollution , Chernobyl disaster, acid rain damage ,Ozone Layer Depletion has led to growing public pressures on governments all over the world
- started imposing stringent legislation with severe penalties in environmental issues environmental & safety system.

Industrialization vs. protection of the environment

- These standards do not lay down specific environmental performance criteria, these are system standards.
- Which describes the management of environment based on company's environmental policy , objectives and targets defined on the basis of their significant environmental effects
- Industry is becoming increasingly concerned about achieving and demonstrating sound environmental performance because of growing compulsions from stringent legislation and Mounting public pressure.
- not long ago, when the harm caused in environment due to human and industrial activities was no body's concern.
- Pollutants affect not only living environment but also social, cultural, political and aesthetic values. In the recent years there is a growing alertness against this environmental pollution.

Industrialization vs. protection of the environment

- The continued increase in the pollution coupled with the industrial revolution has had the vital impact on natural resources.
- The resultant deterioration of environment and fast depletion of natural resources threaten the sustainability of economic development.
- One of the most pressing and complex challenges facing by our generation are to search out a workable synthesis between economic development and environmental behavior.
- So friends we need to compromise our needs to maintain a harmony between these two entities
- i.e Industry & Environment.

Engineers and military

- **military engineering,** the art and practice of designing and building military works and of building and maintaining lines of military transport and communications. Military engineering is the oldest of the engineering skills and was the precursor of the profession of civil engineering.
- Modern military engineering can be divided into three main tasks: (1) combat engineering, or tactical engineer support on the battlefield, (2) strategic support by the execution of works and services needed in the communications zones, such as the construction of airfields and depots, the

civil engineering

civil engineering, the profession of designing and executing structural works that serve the general public. The term was first used in the 18th century to distinguish the newly recognized profession from military engineering, until then preeminent.

From earliest times, however, engineers have engaged in peaceful activities, and many of the civil engineering works of ancient and medieval times—such as the Roman public baths, roads, bridges, and aqueducts; the Flemish canals; the Dutch sea defenses; the French Gothic cathedrals; and many other monuments—reveal a history of inventive genius and persistent experimentation.

Science and technology for medicine

1. discovery of X-rays by German physicist Wilhelm Conrad Roentgen (1845-1923) in 1895 made it possible to look at internal organs of the body.
2. it easier to diagnose broken bones, cancer, and other diseases.
3. Willem Einthoven (1860-1927), a Dutch physiologist, invented the first electrocardiograph.
4. This device records the electrical activity of the heart muscles, making it possible to monitor for heart problems.
5. In the mid-century catheters—thin hollow tubes that can be used to drain fluids or put in medicine—were inserted into the heart and liver.
6. have come in imaging, enabling physicians to see the organs without opening the body.
7. Technologies include ultrasound imaging, computerized tomography (CT-scans), positron-emission tomography (PET scans), and magnetic resonance imaging (MRIs). Diagnostics, while still an art, has become a science too.

Science and technology for medicine

- Modern medicine can replace several of the body's functions through the use of artificial organs and can significantly alter the function of the human body through artificial devices such as, for example, brain implants and pacemakers.
- The fields of Bionics and medical Bionics are dedicated to the study of synthetic implants pertaining to natural systems.
- Conversely, some engineering disciplines view the human body as a biological machine worth studying, and are dedicated to emulating many of its functions by replacing biology with technology.
- This has led to fields such as artificial intelligence, neural networks, fuzzy logic, and robotics.
- There are also substantial interdisciplinary interactions between engineering and medicine.

Science and technology for medicine

- Both fields provide solutions to real world problems.
- moving forward before phenomena are completely understood in a more rigorous scientific sense and therefore experimentation and empirical knowledge is an integral part of both.
- Medicine, in part, studies the function of the human body.
- The human body, as a biological machine, has many functions that can be modeled using Engineering methods.
- The heart for example functions much like a pump, the skeleton is like a linked structure with levers, the brain produces electrical signals etc.
- contribution in the field of medicine.

Science and technology for medicine

- These similarities as well as the increasing importance and application of engineering principles in Medicine, led to the development of the field of biomedical engineering that uses concepts developed in both disciplines.
- Newly emerging branches of science, such as Systems biology, are adapting analytical tools traditionally used for engineering, such as systems modeling and computational analysis, to the description of biological systems.
- Science is helping with advanced and effective antibiotics. Improvements in technology is providing us with better screening techniques and other diagnostic tools and imaging techniques. Science and technology have made great contribution in the field of medicine.

Science and technology for medicine

- Perhaps no field has been affected so much by technology as surgery.
- The various scanning technologies have guided the surgeon into the depths of the body, allowing radical invasive surgeries.
- computers have played a role in the advances of modern medicine.
- Computers are an important component of scanning technology.
- machines in operating rooms and intensive care units.
- Medical records and drug prescriptions may now be kept and transmitted in electronic form.
- And the science behind modern medical practice is based on the research using computers.
- Mapping the human genome would have been impossible without computers to assemble and analyze the vast and complex array of data.

Science and technology for medicine

- Despite all these advances, there are still many diseases that lack adequate treatments.
- While many illnesses can be prevented, there are others that still devastate families and communities.
- And there are many people who lack access to adequate medical care for the diseases that can be cured or prevented.
- What does the future hold?

Engineers in international development

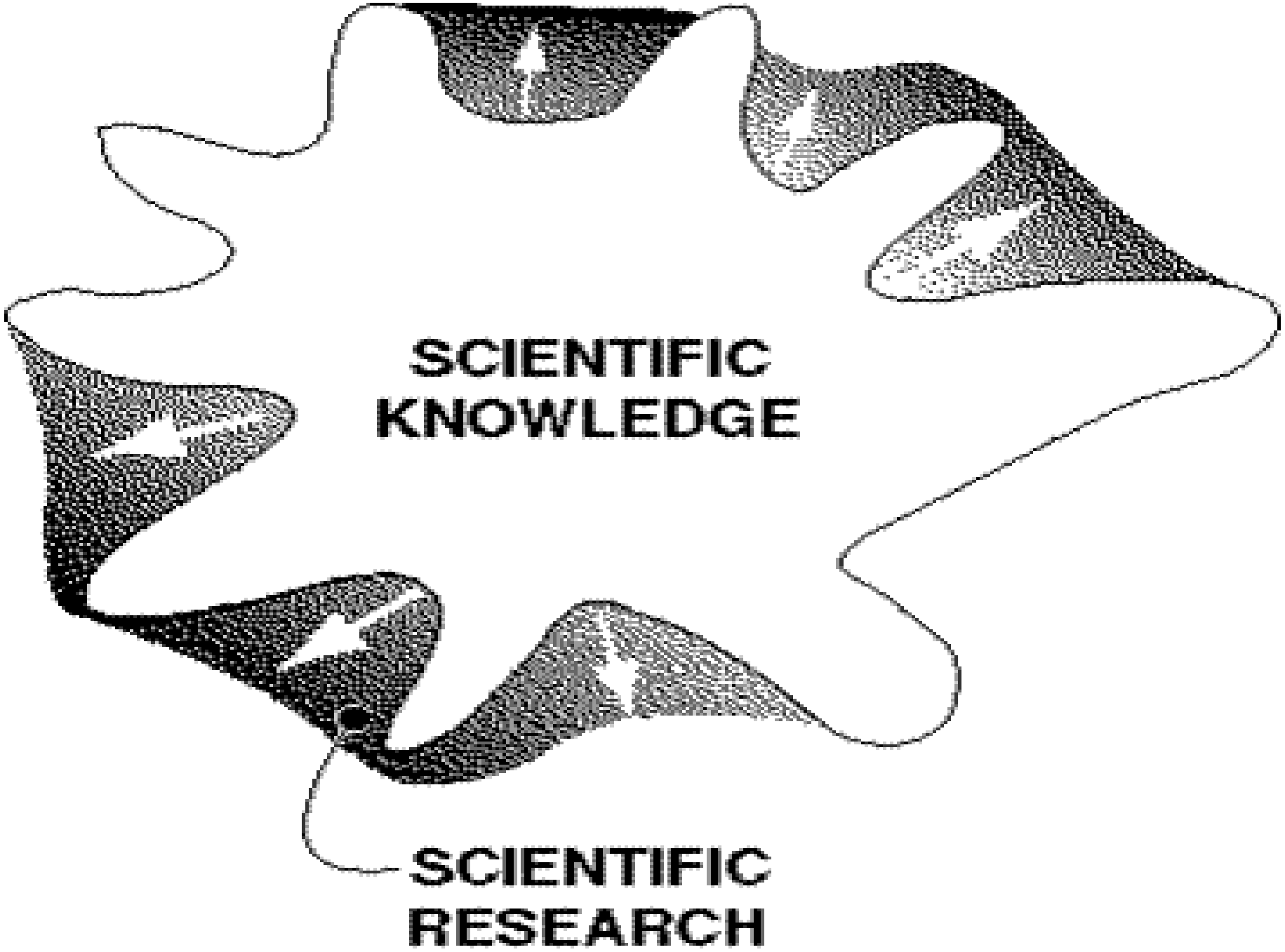
Engineers use their knowledge of science, mathematics, and appropriate experience to find suitable solutions to a problem.

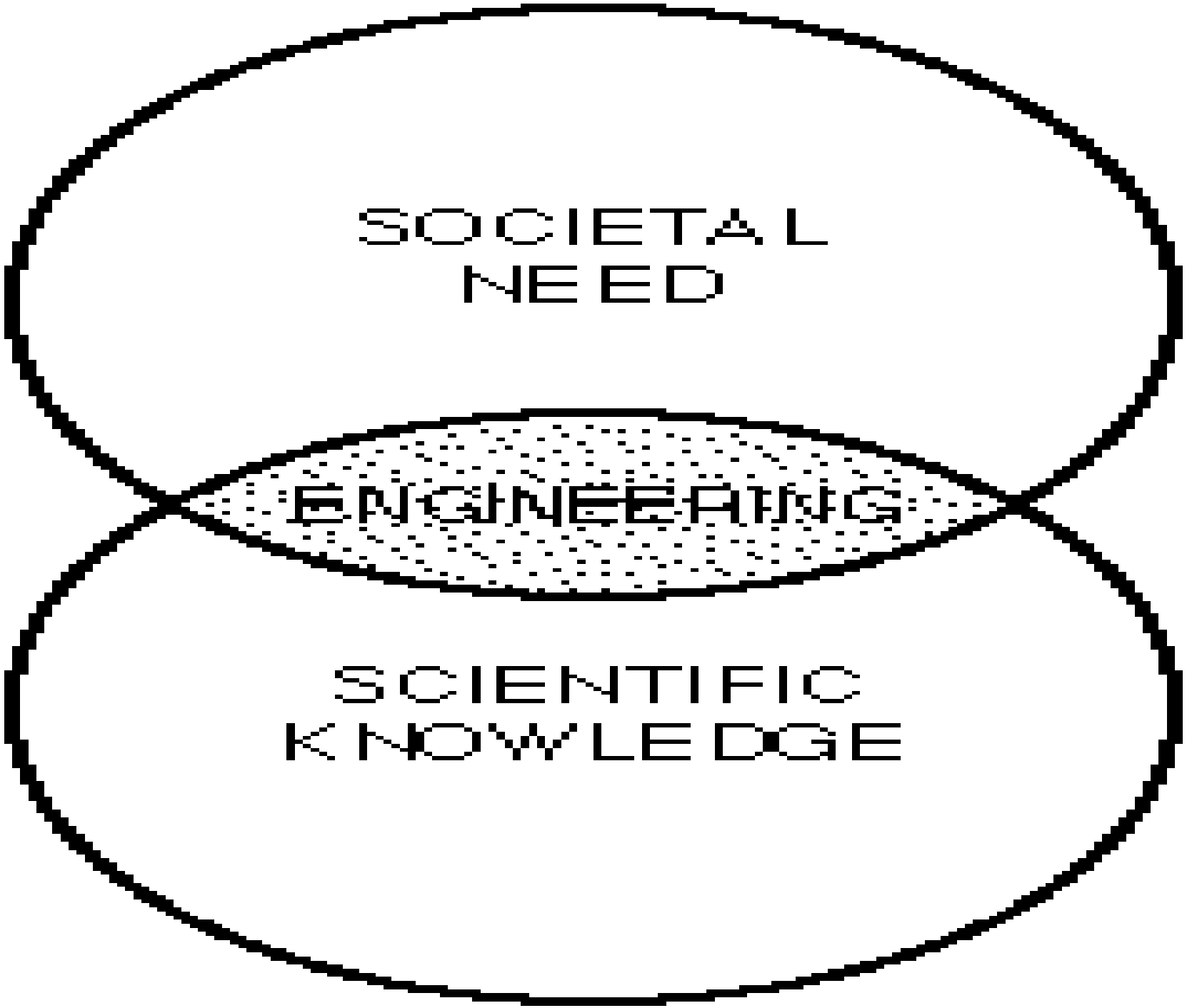
- "Engineering is quite different from science. Scientists try to understand nature.
- Engineers try to make things that do not exist in nature.
- Engineers stress invention.
- To embody an invention the engineer must put his idea in concrete terms, and design something that people can use.
- something can be a device, a gadget, a material, a method, a computing program, an innovative experiment, a new solution to a problem, or an improvement on what is existing.
- Since a design has to be concrete, it must have its geometry, dimensions, and characteristic numbers.
- Almost all engineers working on new designs find that they do not have all the needed information.
- Most often, they are limited by insufficient scientific knowledge.
- study mathematics, physics, chemistry, biology and mechanics.
- have to add to the sciences relevant to their profession.
- engineering sciences are born.

Engineers in international development

Engineers use their knowledge of science, mathematics, and appropriate experience to find suitable solutions to a problem.

- Engineers Without Borders
- Engineers Against Poverty
- Engineers for Disaster Relief
- Engineers for a Sustainable World
- Engineers for humanity


SCIENTIFIC
KNOWLEDGE
SCIENTIFIC
RESEARCH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NEED
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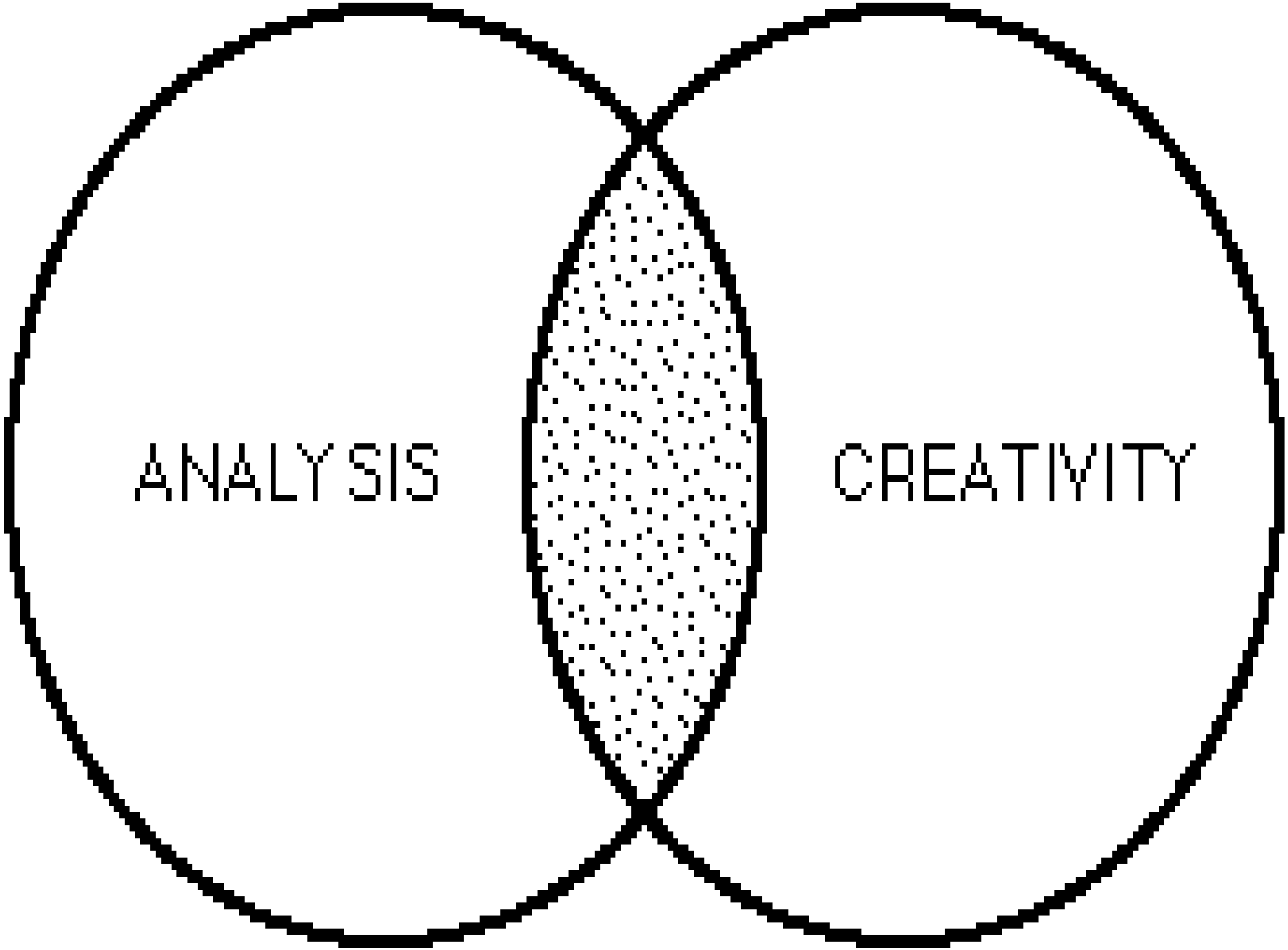
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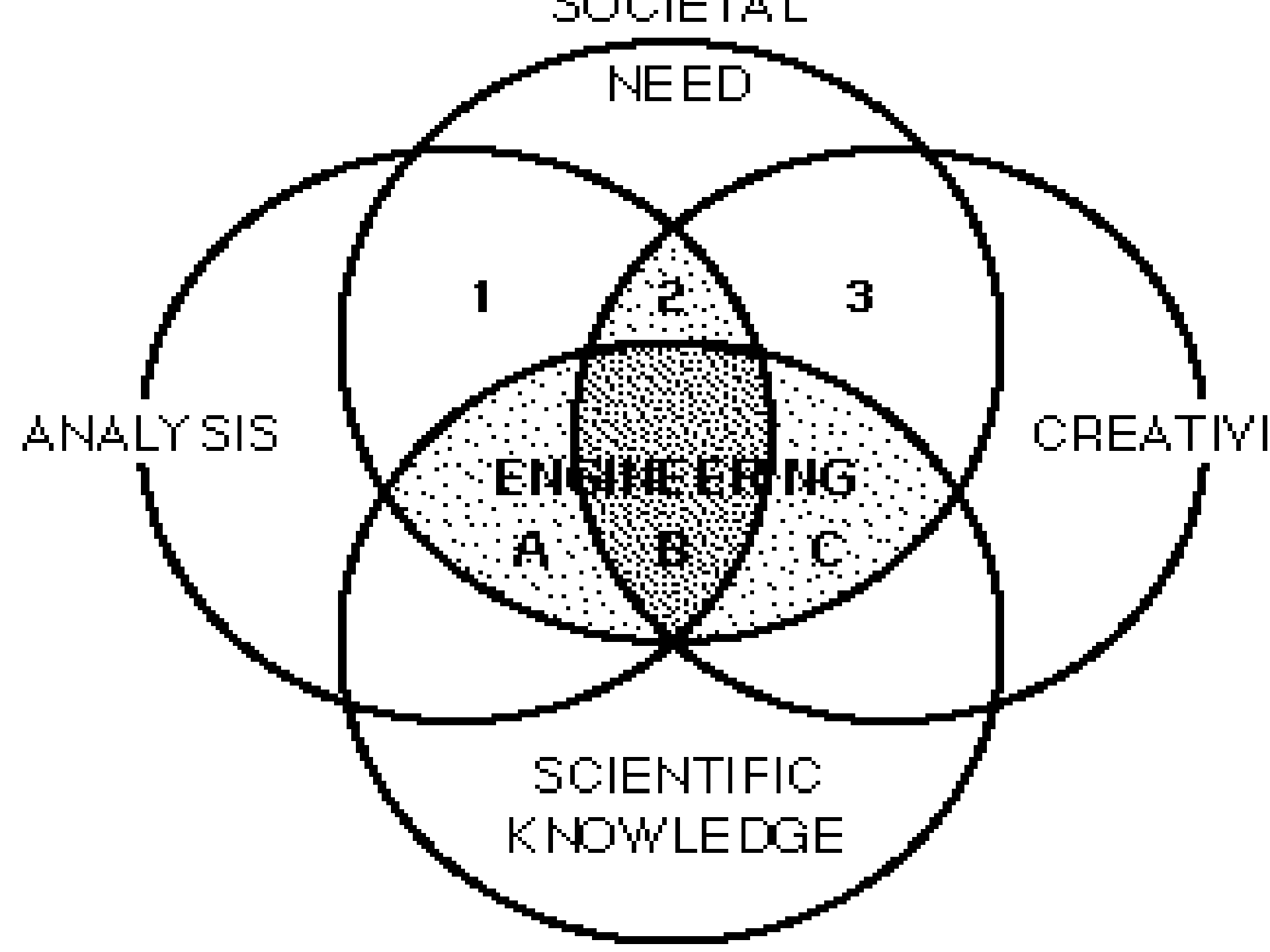
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Via SuccessStory.com
All BIRDS
find SHELTER
during a RAIN
But EAGLE
AVOIDS rain
by FLYING
above the
CLOUDS
- A.P.J Abdul kalam

Science Without Humanity is sin:
Mahatma Gandhi

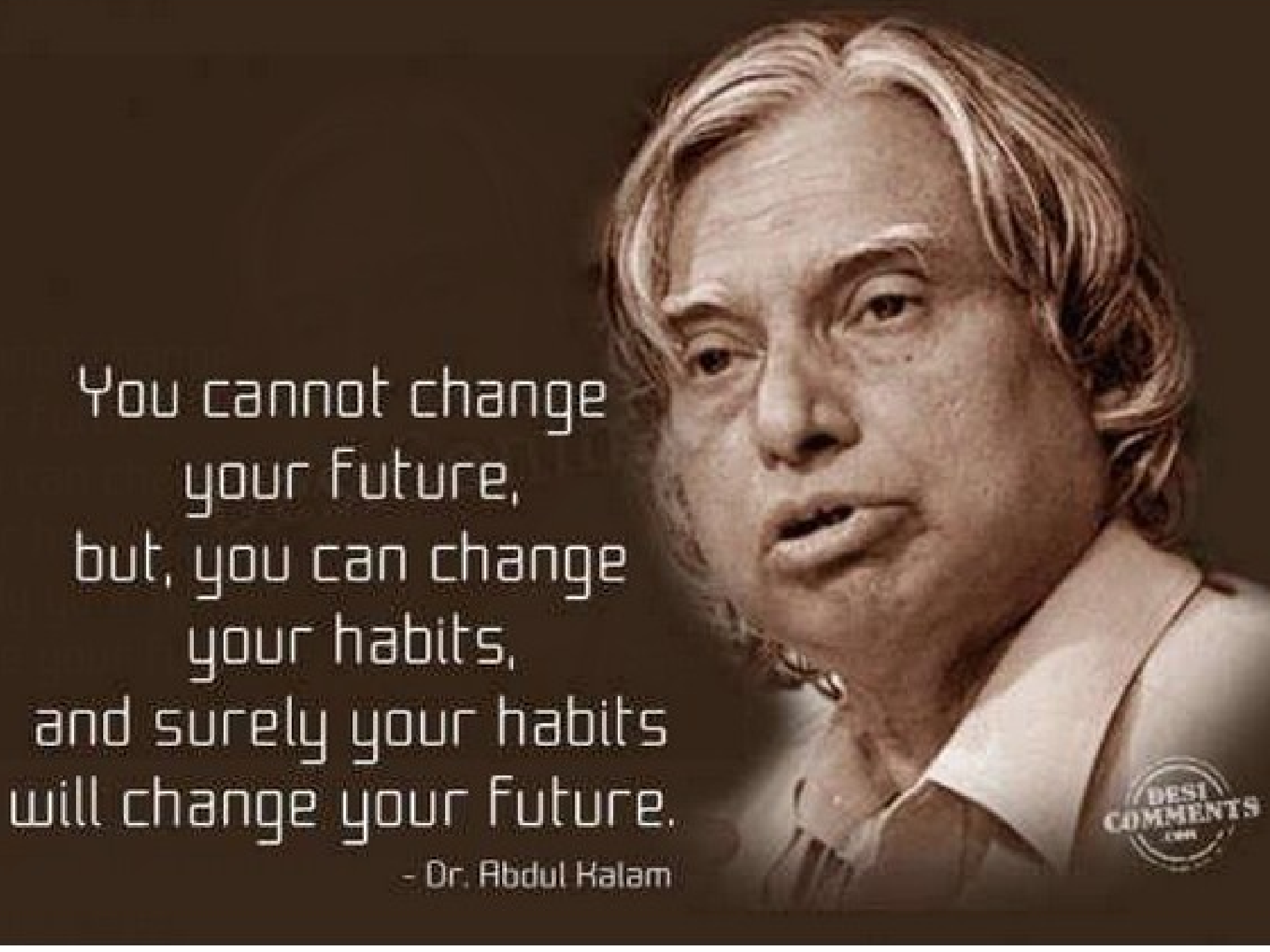
Science without religion is lame, religion without science is blind.
Albert Einstein

Science is global. Einstein's equation, $E=mc^2$, has to reach everywhere. Science is a beautiful gift to humanity, we should not distort it. Science does not differentiate between multiple races.
Abdul Kalam

Our scientific power has outrun our spiritual power. We have guided missiles and misguided men.
Martin Luther King, Jr.

Science can teach us, and I think our own hearts can teach us, no longer to look around for imaginary supports, no longer to invent allies in the sky, but rather to look to our own efforts here below to make this world a fit place to live in, instead.
Bertrand Russell

I am compelled to fear that science will be used to promote the power of dominant groups rather than to make men happy.
Bertrand Russell


You cannot change
your future,
but, you can change
your habits,
and surely your habits
will change your future.
- Dr. Abdul Kalam
DESI COMMENTS

Issues

- A student was killed while 14 were injured when a wall collapsed over makeshift classrooms in Pokhara on Thursday.The wall of the compound belonging to Tibetan refugee camp in Chhorepatan fell over the make shift classrooms of Bhupu Sainik School at 12:15 pm, killing 14-year old Sanjaya Gayak, according to Chief District Office (CDO) of Kaski, Krishna Bahadur Raut. Additionally, 14 others including 4 teachers and 10 students sustained serious injuries and are currently receiving treatment at Gandaki Medical College and other hospitals in Pokhara, Raut informed. The incident took place when the students of classes 8, 9 and 10 were sitting for the quarterly examinations. Raut said the wall might have collapsed after becoming weak due to the incessant rainfall on Wednesday.

Published on: Thursday, July 16, 2015 14:55:22

- Determine the facts in the situation
- Determine the stake holders
- Assess the motivation of the stakeholders
- Formulate the alternative solutions
- Seek additional assistance as appropriate
- Select the most appropriate course of action
- Implemented the selected resolution

Analysis step