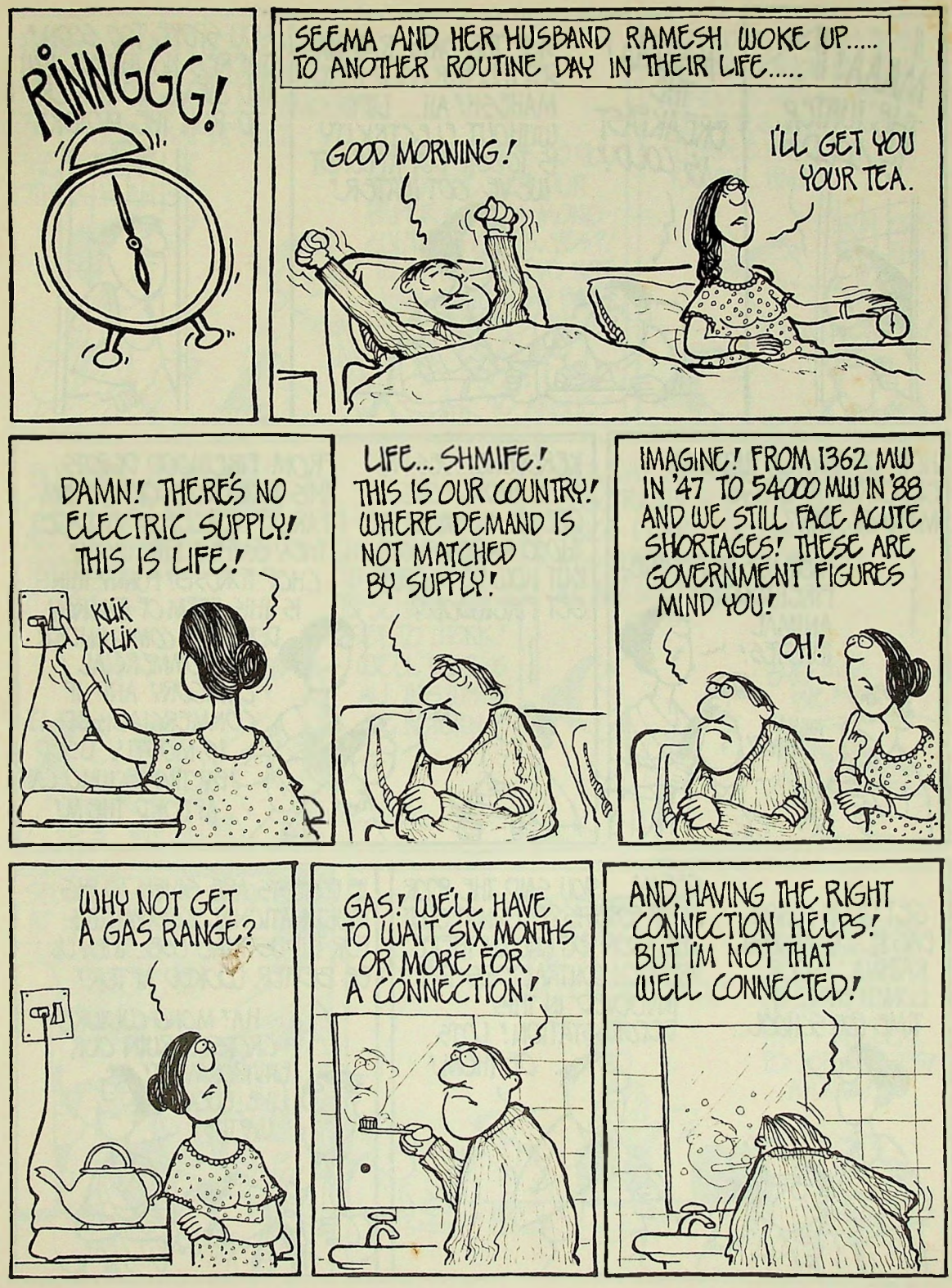
ICRA
EDUCATIONAL
SERIES NO. 3

ENERGY AND DEVELOPMENT

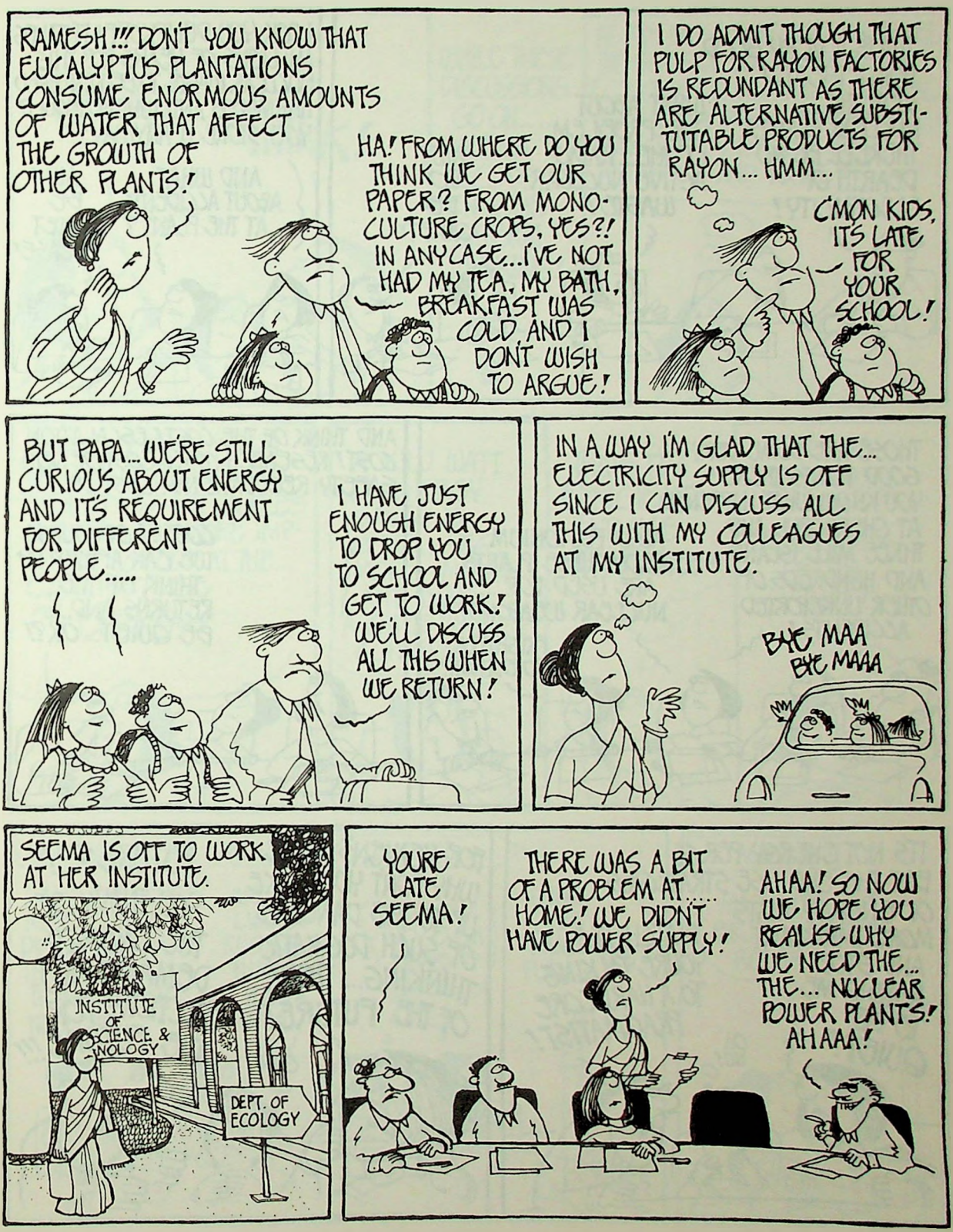
• SEEMA'S DILEMMA •

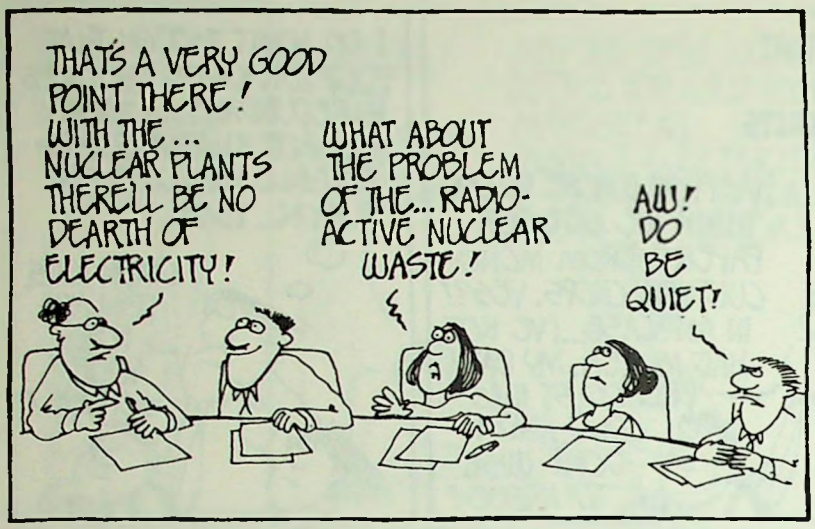
PAUL KURIAN & PONNAPPA

5337

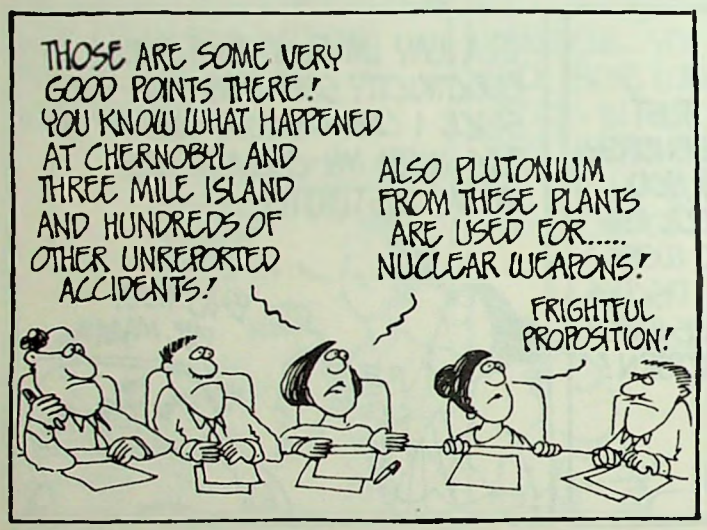

RINNGGG!
SEEMA AND HER HUSBAND RAMESH WOKE UP..... TO ANOTHER ROUTINE DAY IN THEIR LIFE.....
GOOD MORNING!
I'LL GET YOU YOUR TEA.
DAMN! THERE'S NO ELECTRIC SUPPLY! THIS IS LIFE!
KLIK KLIK
LIFE... SHMIFE! THIS IS OUR COUNTRY! WHERE DEMAND IS NOT MATCHED BY SUPPLY!
IMAGINE! FROM 1362 MW IN '47 TO 54000 MW IN '88 AND WE STILL FACE ACUTE SHORTAGES! THESE ARE GOVERNMENT FIGURES MIND YOU!
OH!
WHY NOT GET A GAS RANGE?
GAS! WE'LL HAVE TO WAIT SIX MONTHS OR MORE FOR A CONNECTION!
AND, HAVING THE RIGHT CONNECTION HELPS! BUT I'M NOT THAT WELL CONNECTED!


MAAA! THE WATER IS COLD!
MAAAAA! THE BREAKFAST IS COLD!
SKIP THE BATH, RATHNA! SETTLE FOR COLD FOOD, MAHESH! AH..... LIFE WITHOUT ELECTRICITY IS TOUGH! BUT AT LEAST WE'VE GOT WATER!
YOU SPOKE TOO SOON! THERE'S NO WATER NOW AND WE'VE NO POWER TO RUN THE MOTOR!
HOW DO PEOPLE WITHOUT ELECTRICITY OR GAS MANAGE, MA?
THEY USE KEROSENE, FIREWOOD OR ANIMAL WASTES!
ANIMAL WASTES?!
KEROSENE... YES, I'VE SEEN THOSE LONG QUEUES IN FRONT OF THOSE RATION SHOPS... BUT HOW DO PEOPLE GET FIREWOOD?
FROM FIREWOOD DEPOTS. THIS FIREWOOD COMES FROM FAR OFF PLACES. IN VILLAGES THEY GATHER FIREWOOD... CHOP FORESTS! FUNNY THING IS THIS FORM OF ENERGY DOES NOT COME UNDER THE COMMERCIAL CATEGORY AND IF COMMERCIALISED IT IS MOSTLY USED BY THOSE WHO CAN AFFORD THEM!
OUCH!
GET YOUR SCHOOL BAG READY MAHESH. RATHNA..... YOUR LUNCH BOX... IT'S TIME FOR SCHOOL...
SEEMA....! YOU SAID THE POOR CHOP FORESTS?! IT'S NOT JUST THE POOR YOU KNOW! THERE ARE RICH CONTRACTORS TOO INVOLVED IN THIS..... DEFORESTATION! LOTS OF THEM!
IF FORESTS ARE GIVEN TO BIG MULTINATIONAL COMPANIES FOR INDUSTRIAL USE... THEY'LL BE BETTER LOOKED AFTER!
HA! MONO-CULTURE CROPS'LL RUIN OUR ENVIRONMENT! LIKE... EUCA-LYPTUS!

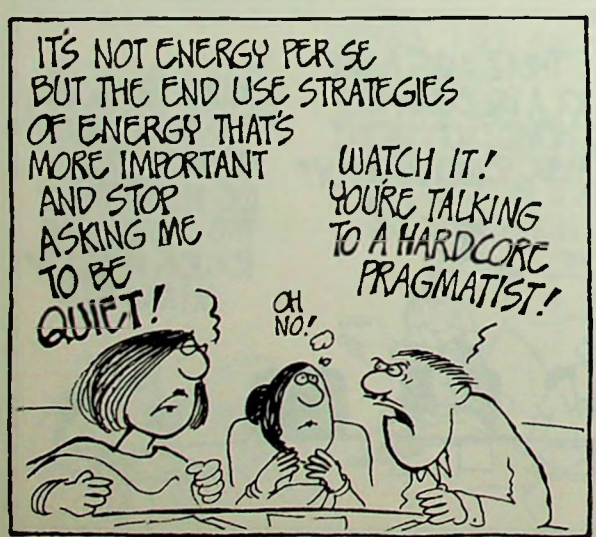

RAMESH!!! DON'T YOU KNOW THAT EUCALYPTUS PLANTATIONS CONSUME ENORMOUS AMOUNTS OF WATER THAT AFFECT THE GROWTH OF OTHER PLANTS!
HA! FROM WHERE DO YOU THINK WE GET OUR PAPER? FROM MONO-CULTURE CROPS, YES?! IN ANY CASE... I'VE NOT HAD MY TEA, MY BATH, BREAKFAST WAS COLD, AND I DON'T WISH TO ARGUE!
I DO ADMIT THOUGH THAT PULP FOR RAYON FACTORIES IS REDUNDANT AS THERE ARE ALTERNATIVE SUBSTI-TUTABLE PRODUCTS FOR RAYON... HMM...
C'MON KIDS, IT'S LATE FOR YOUR SCHOOL!
BUT PAPA... WE'RE STILL CURIOUS ABOUT ENERGY AND IT'S REQUIREMENT FOR DIFFERENT PEOPLE.....
I HAVE JUST ENOUGH ENERGY TO DROP YOU TO SCHOOL AND GET TO WORK! WE'LL DISCUSS ALL THIS WHEN WE RETURN!
IN A WAY I'M GLAD THAT THE... ELECTRICITY SUPPLY IS OFF SINCE I CAN DISCUSS ALL THIS WITH MY COLLEAGUES AT MY INSTITUTE.
BYE MAA BYE MAAA
SEEMA IS OFF TO WORK AT HER INSTITUTE.
INSTITUTE OF SCIENCE & NOLOGY
DEPT. OF ECOLOGY
YOURE LATE SEEMA!
THERE WAS A BIT OF A PROBLEM AT..... HOME! WE DIDN'T HAVE POWER SUPPLY!
AHAA! SO NOW WE HOPE YOU REALISE WHY WE NEED THE... THE... NUCLEAR POWER PLANTS! AHAAA!

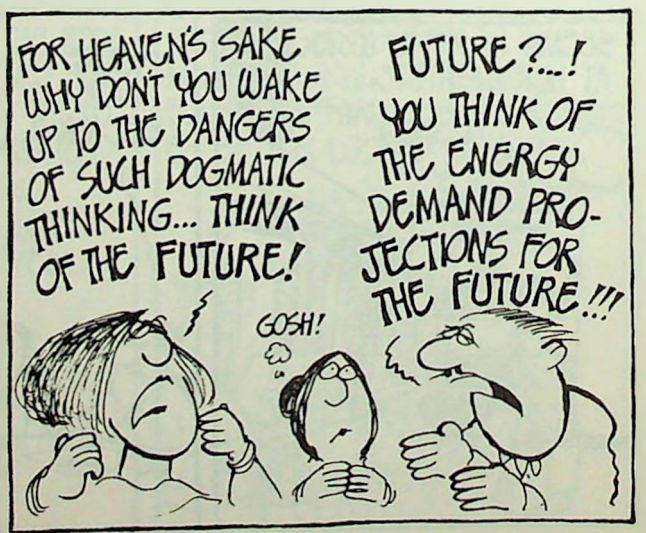

THAT'S A VERY GOOD POINT THERE! WITH THE... NUCLEAR PLANTS THERE'LL BE NO DEARTH OF ELECTRICITY!
WHAT ABOUT THE PROBLEM OF THE... RADIO-ACTIVE NUCLEAR WASTE!
AW! DO BE QUIET!

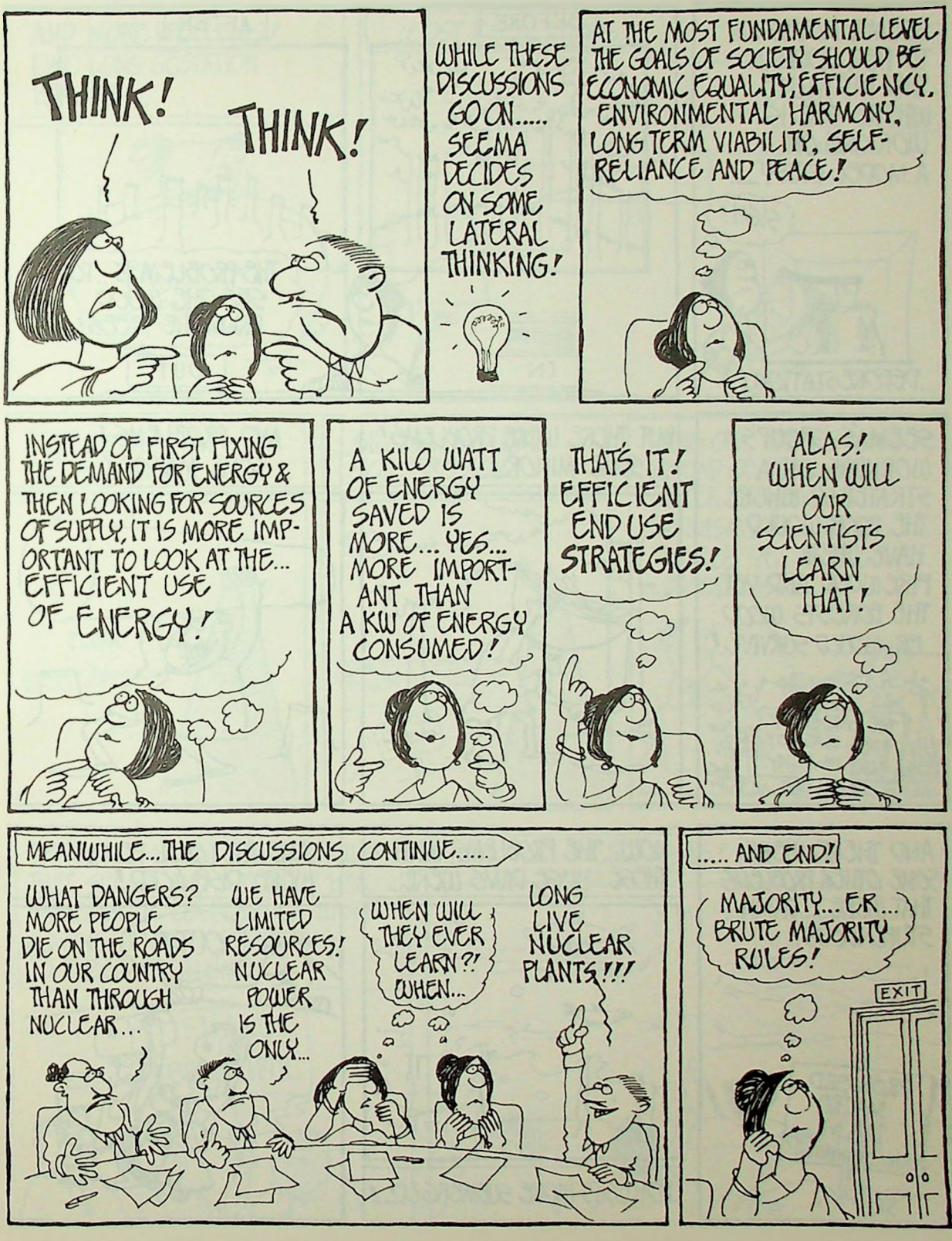

LOOK YOU DUMPKOFF! IT TAKES MILLIONS OF YEARS FOR THIS NUCLEAR WASTE TO BE RENDERED HARMLESS AND WHERE WOULD YOU STORE IT ANYWAY?!
AND WHAT ABOUT ACCIDENTS AT THE PLANT?
AW! BE QUIET PLEASE!


THOSE ARE SOME VERY GOOD POINTS THERE! YOU KNOW WHAT HAPPENED AT CHERNOBYL AND THREE MILE ISLAND AND HUNDREDS OF OTHER UNREPORTED ACCIDENTS!
ALSO PLUTONIUM FROM THESE PLANTS ARE USED FOR..... NUCLEAR WEAPONS!
FRIGHTFUL PROPOSITION!


AND THINK OF THE COST! ESCALATION COST! RESEARCH COST! COST OF NEW SAFETY REGULATIONS! COST OF...
COST?! OF COURSE WE CAN AFFORD IT! THINK OF THE... RETURNS AND..... BE QUIET... OK?!


IT'S NOT ENERGY PER SE BUT THE END USE STRATEGIES OF ENERGY THAT'S MORE IMPORTANT AND STOP ASKING ME TO BE QUIET!
WATCH IT! YOU'RE TALKING TO A HARDCORE PRAGMATIST!
OH NO!


FOR HEAVEN'S SAKE WHY DON'T YOU WAKE UP TO THE DANGERS OF SUCH DOGMATIC THINKING... THINK OF THE FUTURE!
GOSH!
FUTURE?...! YOU THINK OF THE ENERGY DEMAND PRO-JECTIONS FOR THE FUTURE!!!


THINK!
THINK!
WHILE THESE DISCUSSIONS GO ON..... SEEMA DECIDES ON SOME LATERAL THINKING!
AT THE MOST FUNDAMENTAL LEVEL THE GOALS OF SOCIETY SHOULD BE ECONOMIC EQUALITY, EFFICIENCY, ENVIRONMENTAL HARMONY, LONG TERM VIABILITY, SELF-RELIANCE AND PEACE!
INSTEAD OF FIRST FIXING THE DEMAND FOR ENERGY & THEN LOOKING FOR SOURCES OF SUPPLY, IT IS MORE IMPORTANT TO LOOK AT THE... EFFICIENT USE OF ENERGY!
A KILO WATT OF ENERGY SAVED IS MORE... YES... MORE IMPORTANT THAN A KW OF ENERGY CONSUMED!
THAT'S IT! EFFICIENT END USE STRATEGIES!
ALAS! WHEN WILL OUR SCIENTISTS LEARN THAT!
MEANWHILE... THE DISCUSSIONS CONTINUE.....
WHAT DANGERS? MORE PEOPLE DIE ON THE ROADS IN OUR COUNTRY THAN THROUGH NUCLEAR...
WE HAVE LIMITED RESOURCES! NUCLEAR POWER IS THE ONLY...
WHEN WILL THEY EVER LEARN?! WHEN...
LONG LIVE NUCLEAR PLANTS!!!
..... AND END!
MAJORITY... ER... BRUTE MAJORITY RULES!
EXIT

SEEMA MOVES ON TO HER ROOM IN THE INSTITUTE WHERE SHE IS WORKING ON A MODEL STUDY.....

SIGH!

...DEFORESTATION!

BEFORE

AFTER

IN

THE PROBLEM IS...TO SEE THE WOOD FROM THE TREES!

OUT

SEEMA'S GROUP'S WORKING ON A STRATERGY WHERE THE POOR WOULD HAVE THEIR FIREWOOD AND YET THE FORESTS WOOD... ...ER..WOULD SURVIVE!

THE GARDEN OF EDEN WAS NOT BUILT IN A DAY.

BUT THERE WERE PROBLEMS! ... SOME MINOR...

AND PROBLEMS! ... SOME MAJOR!

AND THERE WERE SOME OTHER PROBLEMS THAT WERE.....DAMN... STUPENDOUS!

PROPOSED MACRO DAM ENTRY PROHIBITED!

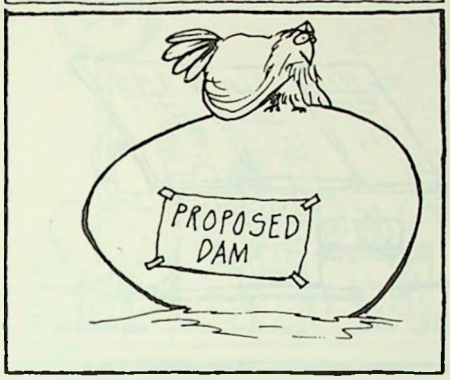
NOW...THE PROBLEMS WITH THESE HUGE DAMS WERE...

FORESTS WERE SUBMERGED..!

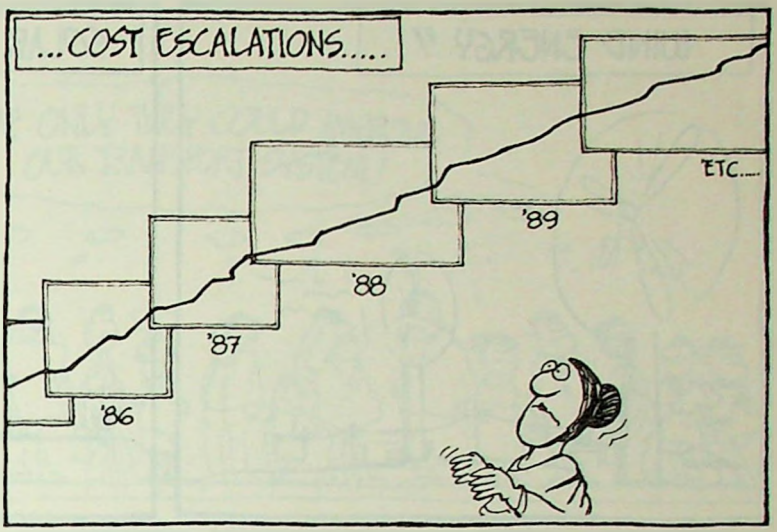
AND THE LOCAL PEOPLE WERE DISPLACED!

OUT!

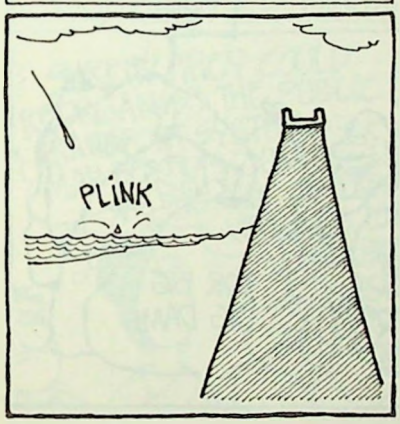
AND MORE PROBLEMS! LIKE LONG GESTATION PERIODS.....



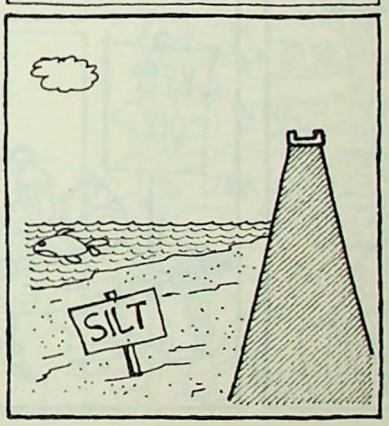
...COST ESCALATIONS.....



DEPENDENCY ON THE MONSOON.....

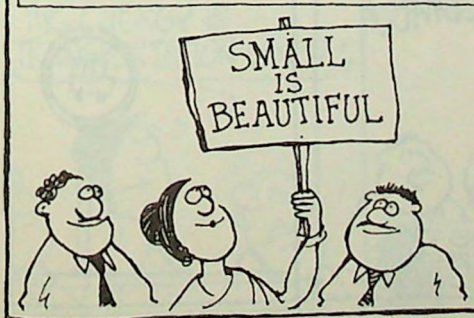


...SILTING UP DUE TO SOIL EROSION.



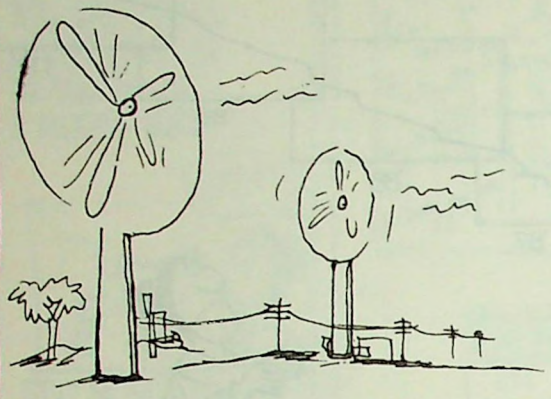
HANG ON... THERE'S MORE! SPREAD OF PESTICIDE... WATER LOGGING..... SALINISATION..... WAIT... THERE'S YET MORE PROBLEMS.....

THE GOOD NEWS HOWEVER WAS THAT SEEMA AND A FEW OF HER SYMPATHETIC COLLEAGUES WERE COMING UP WITH SOLUTIONS TO THESE PROBLEMS!

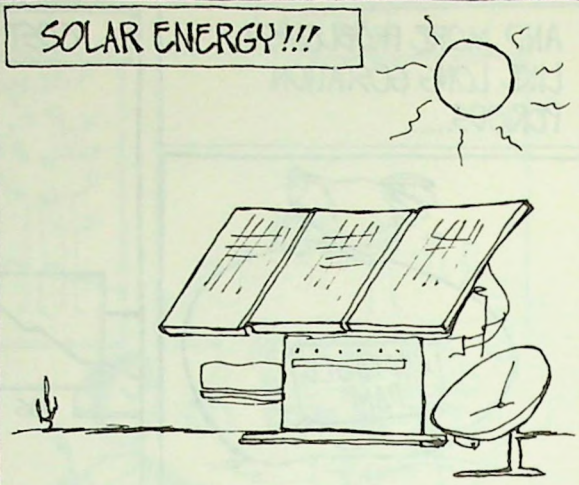


MINI AND MICRO DAMS!

WIND ENERGY !!

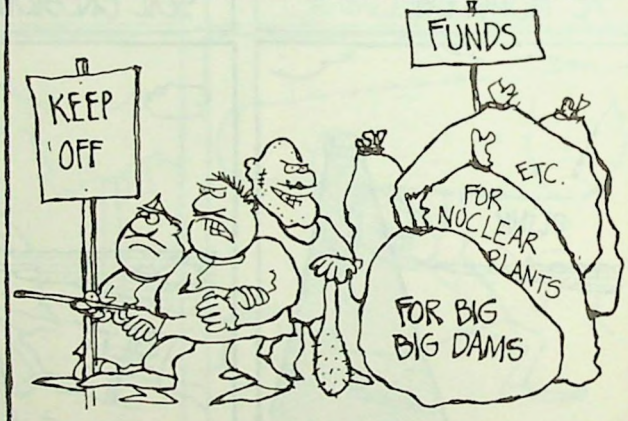


SOLAR ENERGY !!!



BUT THESE FORMS OF ENERGY FACED OTHER PROBLEMS.

MAINLY DUE TO PRESSURE LOBBIES !



ANYHOW... SEEMA AND HER SYMPATHETIC COLLEAGUES CONTINUE WITH THEIR SEARCH FOR IDEAL ENERGY DEVELOPMENT

AT TIMES... FEELING SAD...

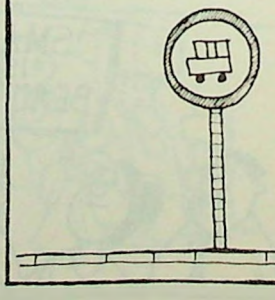
WHEN WILL THEY EVER LEARN..!

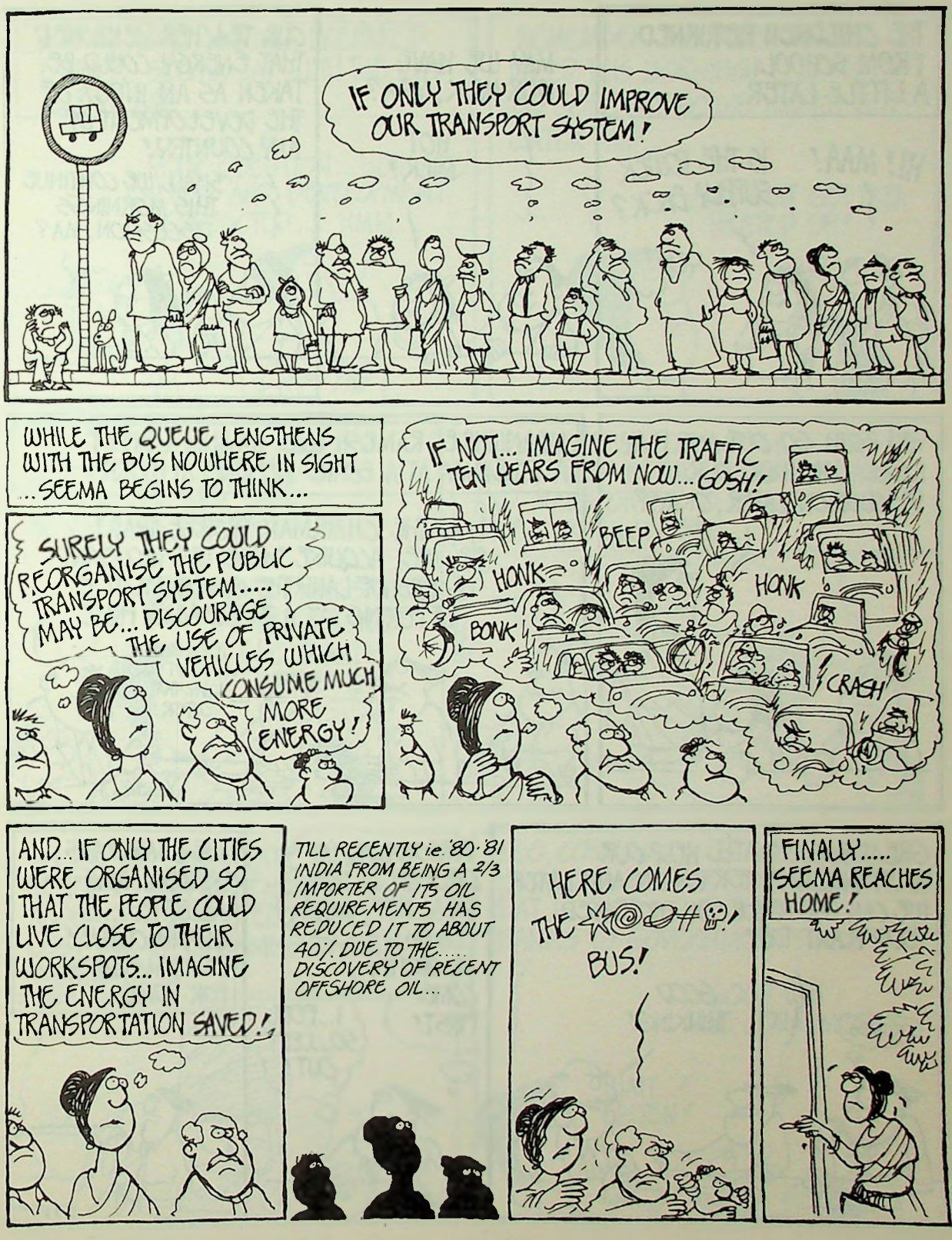
..AT OTHER TIMES... FEELING UPLIFTED*

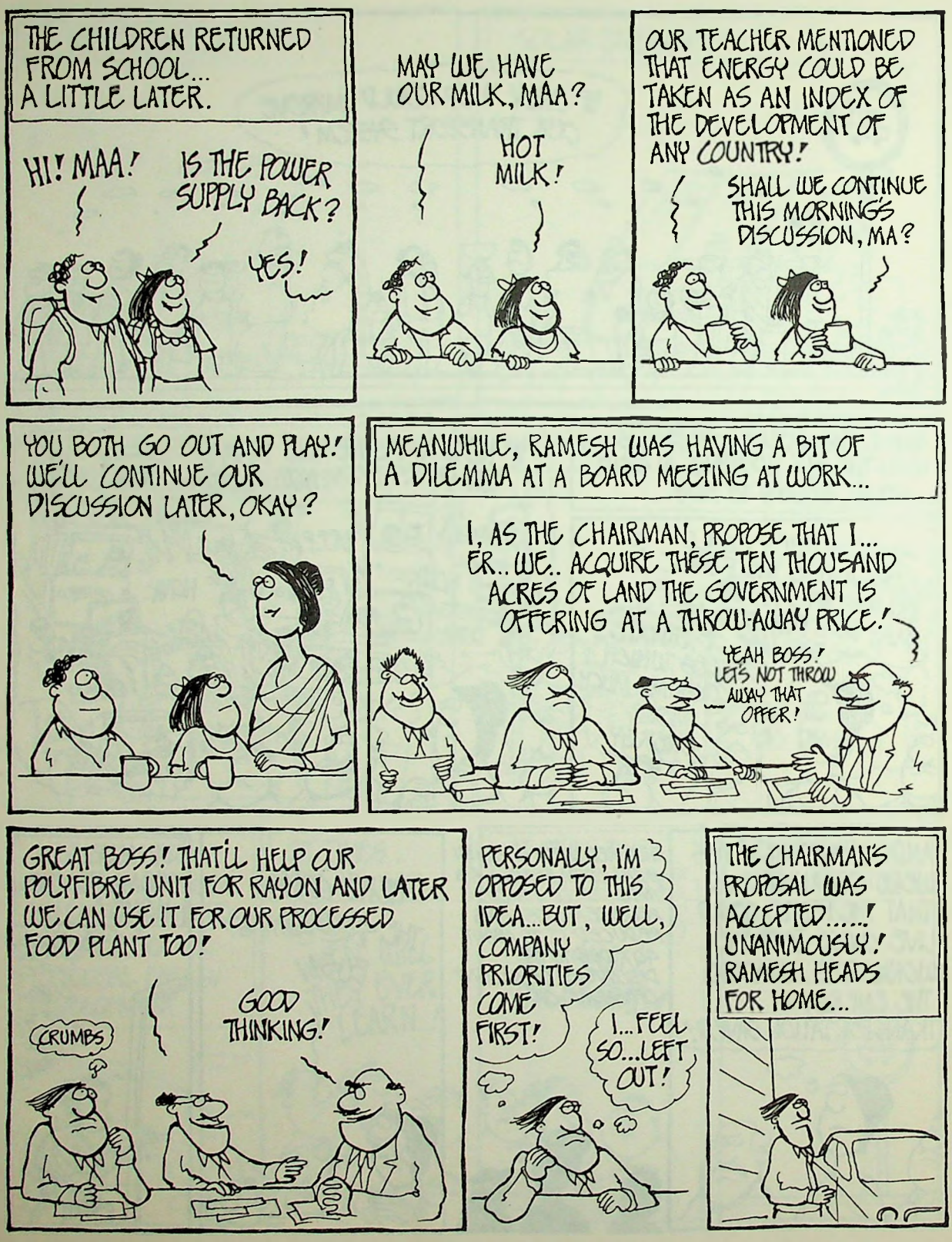
WE SHALL OVERCOME!

*BUT THANKS TO VESTED INTERESTS... MOSTLY FEELING SAD.!

THE DAY'S WORK OVER... IT'S TIME TO HEAD FOR HOME.

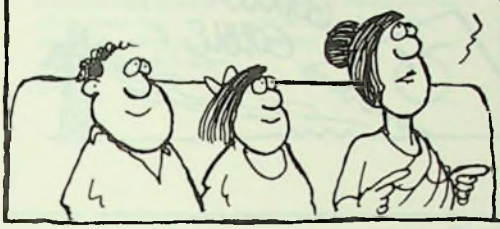



IF ONLY THEY COULD IMPROVE OUR TRANSPORT SYSTEM!
WHILE THE QUEUE LENGTHENS WITH THE BUS NOWHERE IN SIGHT ...SEEMA BEGINS TO THINK...
SURELY THEY COULD REORGANISE THE PUBLIC TRANSPORT SYSTEM..... MAY BE... DISCOURAGE THE USE OF PRIVATE VEHICLES WHICH CONSUME MUCH MORE ENERGY!
IF NOT... IMAGINE THE TRAFFIC TEN YEARS FROM NOW... GOSH!
BEEP
HONK
HONK
BONK
CRASH
AND... IF ONLY THE CITIES WERE ORGANISED SO THAT THE PEOPLE COULD LIVE CLOSE TO THEIR WORKSPOTS... IMAGINE THE ENERGY IN TRANSPORTATION SAVED!
TILL RECENTLY i.e. '80-'81 INDIA FROM BEING A 2/3 IMPORTER OF ITS OIL REQUIREMENTS HAS REDUCED IT TO ABOUT 40%. DUE TO THE..... DISCOVERY OF RECENT OFFSHORE OIL...
HERE COMES THE ☆◎○#☠! BUS!
FINALLY..... SEEMA REACHES HOME!


THE CHILDREN RETURNED FROM SCHOOL... A LITTLE LATER.
HI! MAA!
IS THE POWER SUPPLY BACK?
YES!
MAY WE HAVE OUR MILK, MAA?
HOT MILK!
OUR TEACHER MENTIONED THAT ENERGY COULD BE TAKEN AS AN INDEX OF THE DEVELOPMENT OF ANY COUNTRY!
SHALL WE CONTINUE THIS MORNING'S DISCUSSION, MA?
YOU BOTH GO OUT AND PLAY! WE'LL CONTINUE OUR DISCUSSION LATER, OKAY?
MEANWHILE, RAMESH WAS HAVING A BIT OF A DILEMMA AT A BOARD MEETING AT WORK...
I, AS THE CHAIRMAN, PROPOSE THAT I... ER.. WE.. ACQUIRE THESE TEN THOUSAND ACRES OF LAND THE GOVERNMENT IS OFFERING AT A THROW-AWAY PRICE!
YEAH BOSS! LET'S NOT THROW AWAY THAT OFFER!
GREAT BOSS! THAT'LL HELP OUR POLYFIBRE UNIT FOR RAYON AND LATER WE CAN USE IT FOR OUR PROCESSED FOOD PLANT TOO!
CRUMBS
GOOD THINKING!
PERSONALLY, I'M OPPOSED TO THIS IDEA... BUT, WELL, COMPANY PRIORITIES COME FIRST!
I... FEEL SO... LEFT OUT!
THE CHAIRMAN'S PROPOSAL WAS ACCEPTED.....! UNANIMOUSLY! RAMESH HEADS FOR HOME...

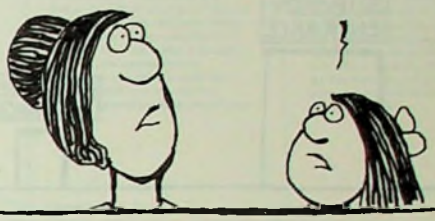
...AND AT HOME, HAVING PREPARED DINNER, SEEMA SAT WITH THE KIDS TO EXPLAIN.....

...YOUR QUESTION... HOW ARE ENERGY AND DEVELOPMENT CONNECTED..... HMM...



REMEMBER THE PROBLEM WE FACED THIS MORNING! ELECTRICITY HAD GONE OFF SO WE HAD NO HOT WATER AND...

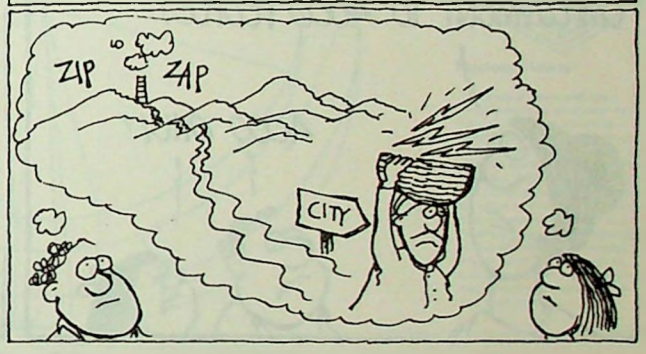
AND THAT GOT PAPA HEATED UP!



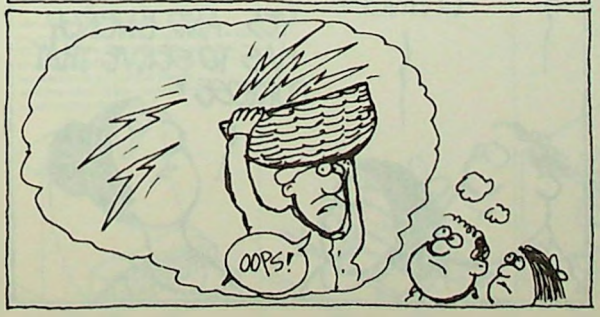
IMAGINE THE PLIGHT OF THE PEOPLE WHO HAVE NO ELECTRICITY AT ALL!

GOOD! THAT BRINGS US TO THE QUESTION OF ELECTRICITY DISTRIBUTION. SO LISTEN!

"ELECTRICITY IS PRODUCED HUNDREDS OF MILES AWAY IN THE WESTERN GHATS AND TRANSPORTED TO BANGALORE AND OTHER URBAN CENTRES..."



"WHILE THE GHAT PEOPLE DO NOT BENEFIT FROM THIS ENERGY SOURCE, ABOUT 20% OF THIS ELECTRICITY IS LOST DUE TO TRANSMISSION AND DISTRIBUTION!"

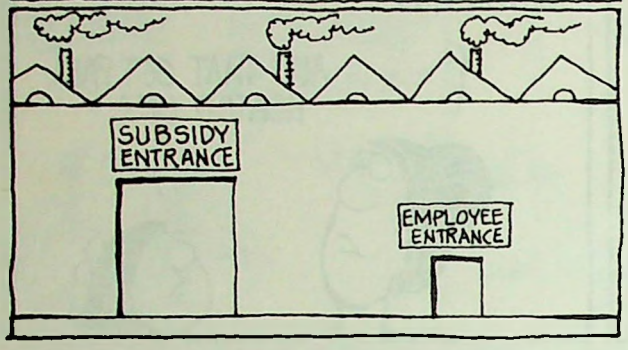


ALSO, CONSUMERS PAY LESS THAN THE ACTUAL COST OF ELECTRICITY THAT IS SUPPLIED TO THEM..... THANKS TO GOVERNMENT SUBSIDIES!

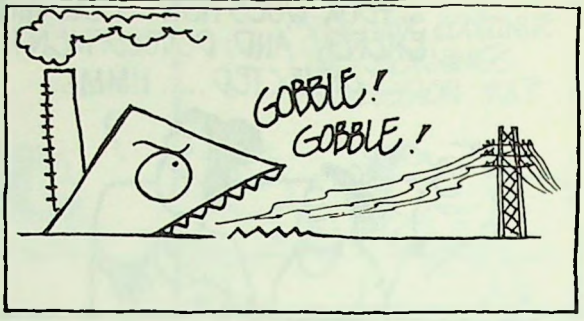
GOOD FOR THE CONSUMERS!

WAIT...! LISTEN!

"MANY OF THE BIG INDUSTRIES AROUND BANGALORE ALSO RECEIVE HEAVY SUBSIDIES BUT THEY EMPLOY VERY FEW PEOPLE!"

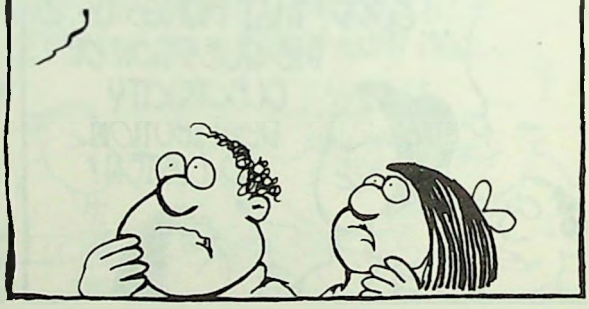


IN FACT A RECENT REPORT ON KARNATAKA SHOWS THAT NOT ONLY DOES THE INDUSTRIAL SECTOR USE 74% OF THE STATE'S ELECTRICAL OUTPUT OF 6,181,000,000 KWh...!

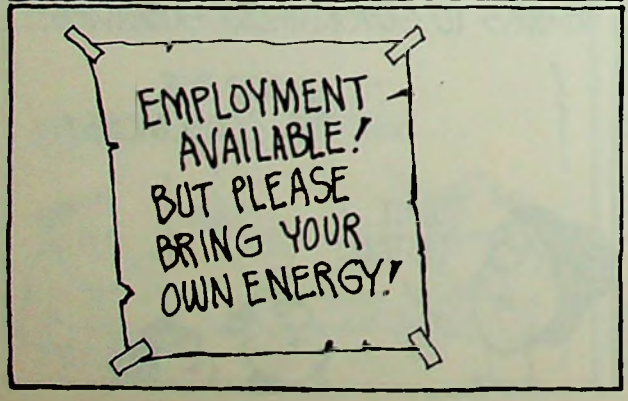


...BUT JUST 18 MAJOR ELECTRO-METALLURGICAL INDUSTRIES CONSUMED TOJO-THIRDS OF THE INDUSTRIAL ELECTRICITY AND GAVE DIRECT EMPLOYMENT TO 4000 PEOPLE!

IN CONTRAST 1200 OTHER ELECTRICITY-USING INDUSTRIES USED THE REMAINING ONE-THIRD OF THE ELECTRICITY BUT PROVIDED EMPLOYMENT FOR 250,000 PEOPLE!



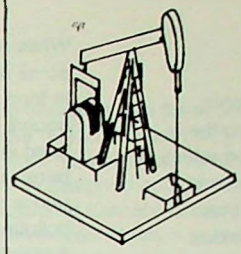
"FOR EMPLOYMENT PURPOSES MANY OF THE OTHERS HAD TO DO WITH OTHER SOURCES OF ENERGY!"



SO EMPLOYMENT IS CONNECTED TO DEVELOPMENT!

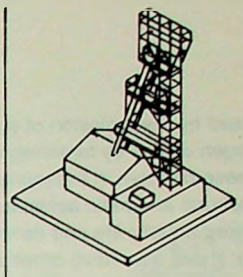
Earlier the sun was the main source of energy available to humankind. Then the first energy that was used by humankind was wood. Wind energy to drive sails was used about 5000 years ago, windmills 2000 years later and water wheels 2000 years after that. The use of coal started about 300 years ago and oil and gas only in the last 100 years. It was only in the 20th century that geothermal and nuclear power arose. The environmentally harmful effects of the non-renewable energy sources (and the fact that its supply is limited) is today focusing attention on safe and renewable energy sources. But at the moment very little funding is going into the development of safe energy sources mainly because there is still fossil fuels available for the industrialised countries at economical costs. In fact the International Energy Agency concludes that current economic and technical constraints would most likely postpone major breakthroughs in renewable energy sources till sometime in the next century.

Non-renewables



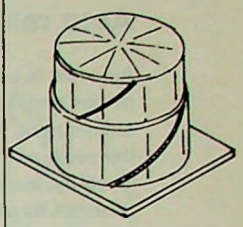
Oil

a(1) Oil is the world's most important energy source. But its supply is restricted and it may eventually run out. And its present consumption is not declining but increasing. Oil consumption rose 3.1 percent globally and oil production averaged 68 metric tons per day in 1988. More important it is a major source of environmental pollution.



Coal

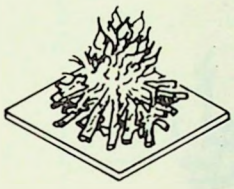
a(2) Coal is the most abundant of fossil fuels. It supplies some 30% of global energy. Three countries, China, the USSR and the US control 57% of the world's reserves. Its use is increasing - it increased by 3.7% between 1987 and 1988. It is also a major environmental hazard. Emissions of sulphurdioxide and carbondioxide will intensify the problem of acid rain and greenhouse effect.



Natural Gas

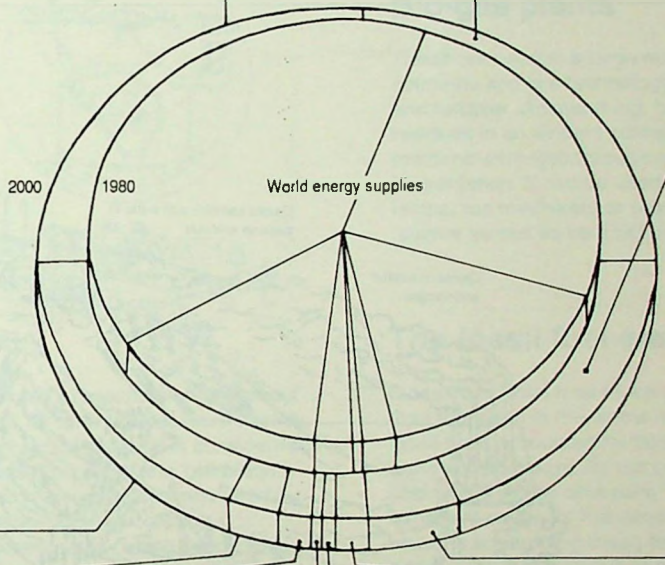
a(3) Natural gas is one of the fastest growing energy source. Natural gas provides about 20% of global energy and it rose by 4.7% in 1988. But its extraction and actual use is beset by a number of technical problems and hence is likely to be restricted to only a few countries. While it is also environmentally polluting it is not considered to be as serious as the other fossil fuels.

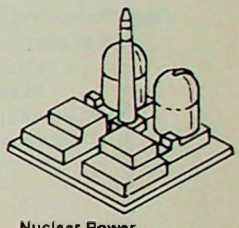
Renewables



Biomass

b(1) Biomass constitutes all plant or animal waste which can be used as fuel. More than half the world's population depend on this as their major source of energy. More than that, this is the source for the majority of the poor in the developing countries who constitute more than 80%. While it is also polluting it is the only option that the poor have.





Nuclear Power

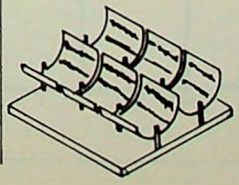
c(1) Nuclear power was once considered to be an answer to all the world's energy problems. It supplies over 2% of total energy demand. At the moment there are over 262 plants operating in different countries. While in many countries new plants are under construction, the future of this source of energy does not appear to be too bright. Escalating costs, public opposition (especially after the Chernobyl reactor accident), problems of radioactive waste disposal do not make this an ecologically safe source of energy.

Hydropower

b(2) Hydroelectricity provides almost 7% of global energy and generates more tahn 25% of the world's electricity. While it is substantially used, it is still an underexploited source. The problem with these dams is the scale in which they are contructed. Big dams tend to submerge huge areas, displace people, submerge forests and create a host of other problems. Preference, if given to small dams which directly serve local communities would be ecologically safer. China has built 90,000 small-scale hydrounits which produce 5,000 MW of electricity - the equivalent of six nuclear power stations. Most of the dams serve the local communities.

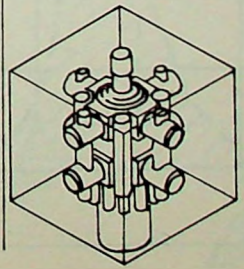
Solar

b(3) Solar energy promises to be one of the ecologically safest and unlimited source of energy. The problem with this is that it is sparce energy and needs appropriate collectors to concentrate the energy. Substantial progress has been made in the development of photovoltaic cells which could collect this energy. But further research needs to be done in order to make it economically viable.



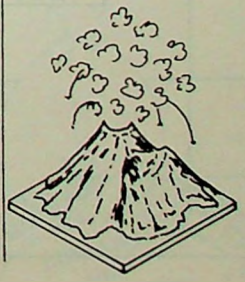
Ocean Power

b(4) The different forms of ocean power are wave power, tidal power, current power and ocean thermal energy conversion - a process which exploits the temperature difference between the surface and the ocean depth. The energy potential for this is unlimited in many ways. But at the moment only a small proportion of this safe energy source is tapped because of very little funding that goes into it.



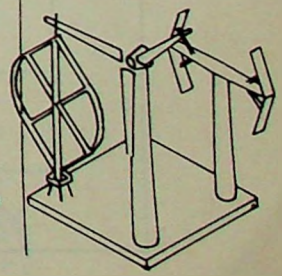
Geothermal

b(5) The temperature of the earth's increases by 1°C for every 30m depth. This is especially so in geologically active areas. This temperature difference could be exploited either directly to heat water or to produce electricity. At the moment there are more than 130 geothermal power plants producing electricity.



Wind

b(6) Uneven heating of the earths surface cause winds. This has tremendous potential for some countries. In fact India is one country which is considered to have great potential. But prior to the introduction of these windmills a proper windmapping is necessary. Very often in India this is not done and windmills are installed resulting in a tremendous waste. Windmills can serve both purposes - either directly generate electricity or do mechanical work. This is also an ecologically safe source of energy.

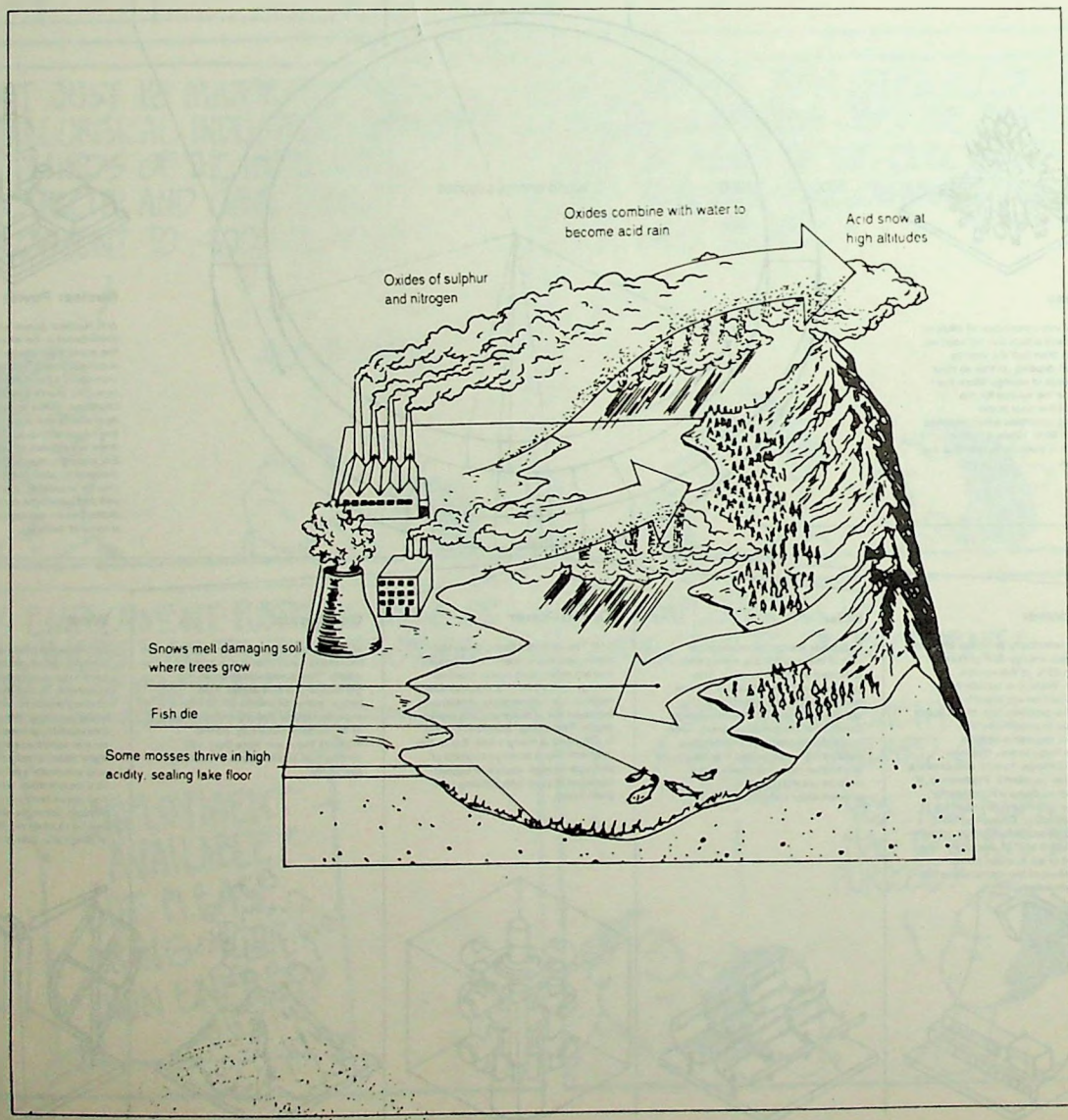


Acid rain

Acid rain is caused by the emission of sulphur oxides and nitrogen oxides by factories into the atmosphere. These dissolve in the rain and return to the earth as sulphuric and nitric acids. It affects lakes by destroying aquatic life and as well as destroys forests. It can also have other serious effects on the ecosystem. The acidified water leaches important plant nutrients out of the ground and activates heavy metals such as cadmium and mercury which would contaminate water supplies.

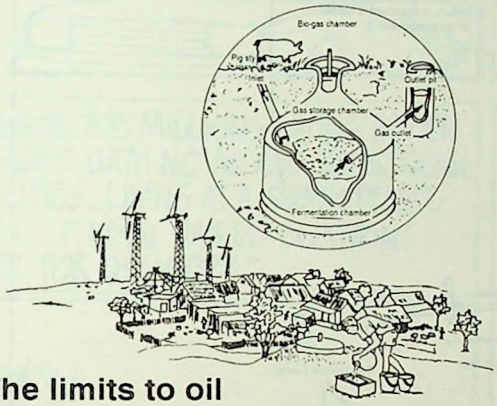
While acid rain is not of immediate importance to some developing countries the greater threat comes in form of general atmospheric pollution. One source of this is the heavily leaded petrol that is used in these countries. Winds often carry these rains to places distant from their origin. While acid rain is only one form of the general atmospheric pollution, it reflects the ecological consequences of a specific form of industrialisation that is being followed by the industrialised countries and is now being immitated by the developing countries.

Source: *The Gaia Atlas of Planet Management.*



More efficient Stoves

More than 80% of the people in the developing countries use firewood for cooking. Most of then use the open "three-stone" fire that is both dirty and dangerous. The amount of smoke that the women inhales leads to all kinds of health hazards. Stoves which are more efficiently designed could increase the efficiency and as well as reduce the health hazard. In Karnataka there is an efficient wood burning stove which has been developed which is popularly known as the 'Astra Ole'. The rural development department has already built 2,00,000 'Astra Oles'. While the practical efficiency of these stoves have been called into question with only 60% of these stoves being effectively used this modest rate of success has resulted in a net saving of 50,000 tonnes of firewood a year. Also there are intangible benefits such as a cleaner environment, improvement in the health of rural women, saving in cooking time, etc. To meet urban requirements a portable metalic wood burning stove having an efficiency of 40% known as 'Swasthee' has been developed.



Bio-gas plants

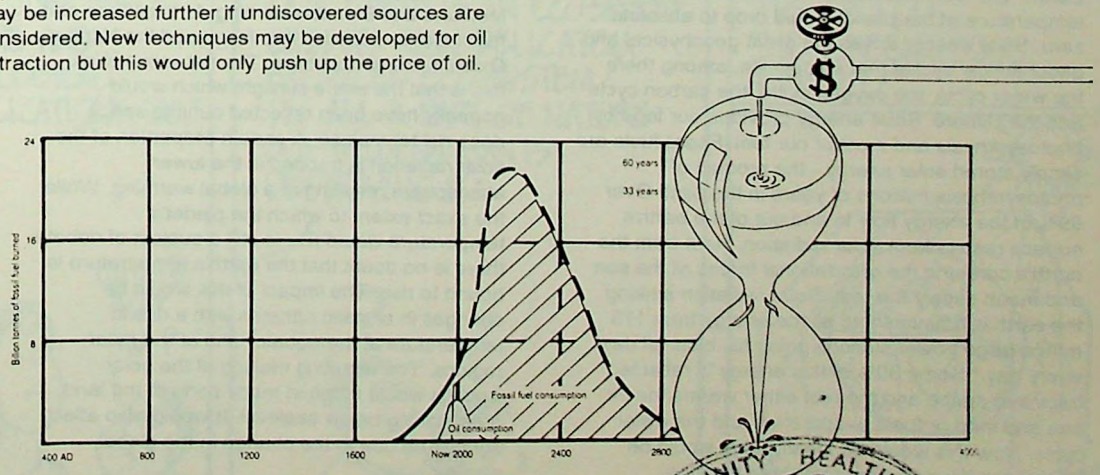
These are used in a large number of developing countries and is a technology that provides both fuel and fertilizer. Animal dung, human excreta or crop residues in an air tight container provides a methane-crich gas through a process of fermentation. It can be used to heat stoves, light lamps, run machinery or produce electricity. The residue serves as very rich fertiliser.

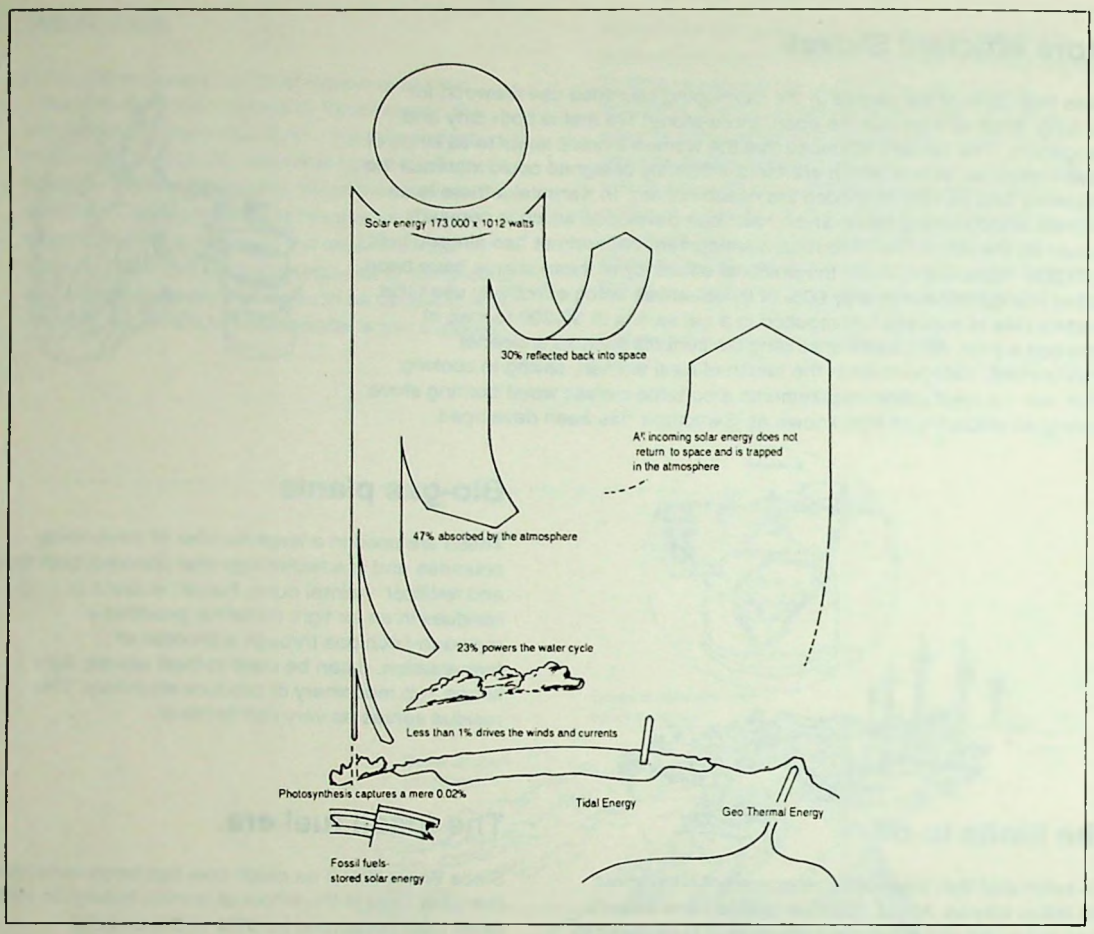
The limits to oil

It is estimated that the world's resources of oil is about 300 billion tonnes. About 70 billion tonnes have already been extracted and the current reserves is considered to be some 90 billion tonnes. The remaining 140 billion tonnes are reserves which are yet to be discovered if they exist in the first place. But if we continue consuming oil at the present rates (which keeps increasing) the present known reserves would be depleted in about 30 years or even less. The time span may be increased further if undiscovered sources are considered. New techniques may be developed for oil extraction but this would only push up the price of oil.

The fossil fuel era.

Since World War II as much coal has been consumed than that used in the whole of human history. In 1982 fossil fuels accounted for 90% of the world's commercial energy. By the end of the 21st century only coal would still be abundant. But the use of coal is an important cause for the Green House effect. At present humans are burning these fossil fuels which currently add 5.7 (plus or minus 0.5) gigatonnes of carbon to the atmosphere

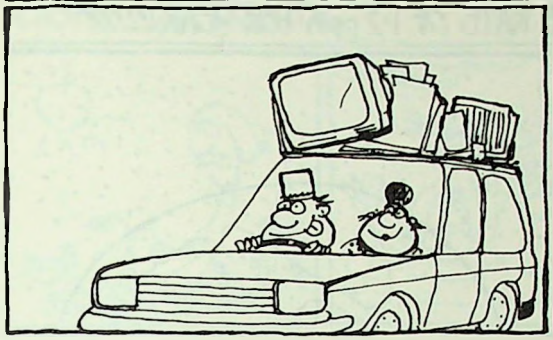




The global powerhouse and the Greenhouse effect

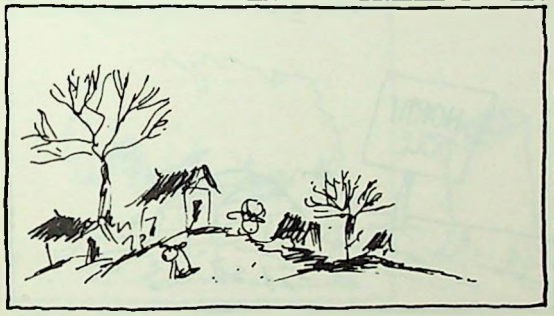
Energy from the sun is really the source of all life on Earth. "Without it the oceans would freeze and the temperature of the planet would drop to absolute zero. Solar energy drives the great geophysical and geochemical cycles that sustain life, among them the water cycle, the oxygen cycle, the carbon cycle and the climate. Solar energy provides our food by photosynthesis and most of our fuel. Fossil fuels are simply stored solar energy - the product of photosynthesis millions of years in the past. Over 99% of the energy flow in and out of the earth's surface results from solar radiation. Heat from the earth's core and the gravitational forces of the sun and moon supply the rest. Solar radiation striking the earth is equivalent to all the energy from 173 million large power stations going full blast all day, every day." Some 30% of this energy is reflected back into space and the rest either warms the air, sea and land or fuels evaporation and the water cycle. Now this would be ideally what would be happening if we had not tampered with the atmosphere. But the pollution of the atmosphere through fossil fuel burning and deforestation we have increased the presence of carbon dioxide in the atmosphere. Through our various industrial processes we have increased Chlorofluorocarbons and other related gases. Certain agricultural practices have increased the Methane and Biomass burning, fertilizer use and fossil fuel combustion has increased the Nitrous Oxide in the atmosphere. The net result of all this is that the entire sunlight which would normally have been reflected out into space does not take place. A certain proportion of the solar radiation is trapped in the lower atmosphere resulting in a global warming. While the exact extent to which the planet's temperature would rise is still a subject of debate there is no doubt that the earth's temperature is bound to rise. The impact of this would be changes in climatic patterns with a rise in temperature at the equator and at the polar regions. The resulting melting of the polar icecaps would result in many parts of the land area sinking below sealevel. It would also affect agriculture due to the change in the global climate.

"THE BULK OF THE MODERN FACILITIES CREATED IN THE NAME OF DEVELOPMENT IS NOW TAKEN AWAY BY A SMALL ELITE..."



"...WHILE THE MAJORITY HAS TO DO WITH WHATEVER IT CAN FIND!"

"IMAGINE THE MILLIONS LIVING IN OUR VILLAGES WITH NO ACCESS TO MODERN FACILITIES...LIVING AT A SUBSISTENCE LEVEL...! WHAT HAS DEVELOPMENT DONE FOR THEM!?!"



SO THE IMPLICATIONS OF BUILDING THESE HUGE DAMS ARE... FORESTS ARE SUBMERGED, THOUSANDS OF PEOPLE DISPLACED...

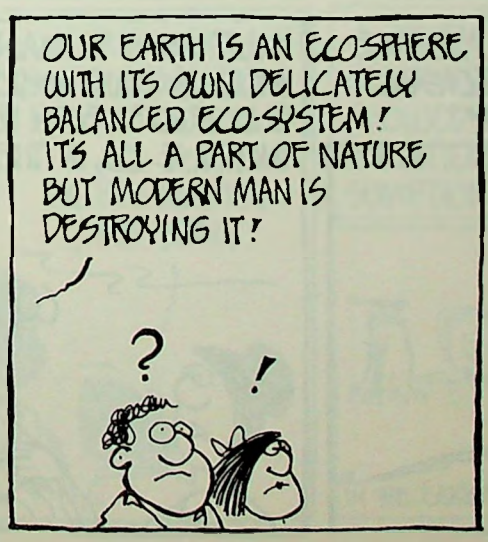
BUT THEY PROMISE TO RESETTLE THEM DON'T THEY?

HA! GROW UP BROTHER!

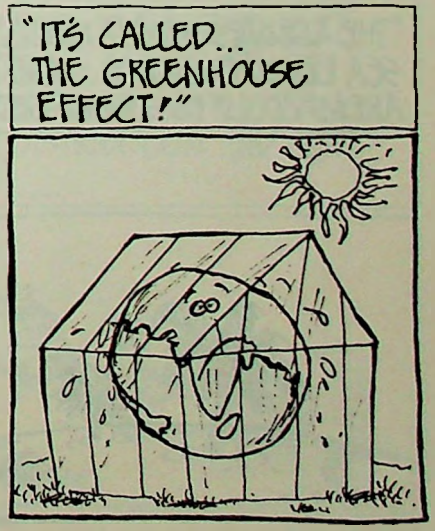
NOT JUST THAT! THERE ARE... ECOLOGICAL IMPLICATIONS TOO!

WHAT'S THAT MA?

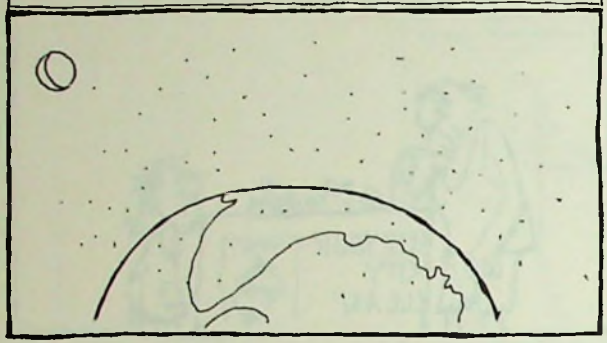
OUR EARTH IS AN ECO-SPHERE WITH ITS OWN DELICATELY BALANCED ECO-SYSTEM! IT'S ALL A PART OF NATURE BUT MODERN MAN IS DESTROYING IT!



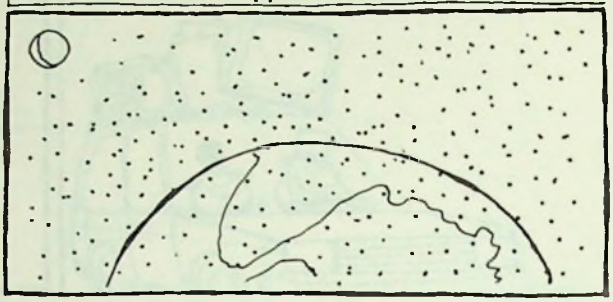
"IT'S CALLED... THE GREENHOUSE EFFECT!"



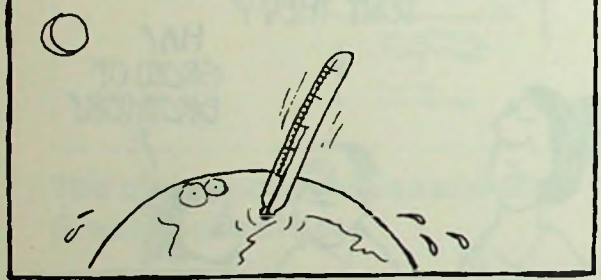
"BEFORE THE INDUSTRIAL REVOLUTION THE CARBON DIOXIDE CONCENTRATION IN THE ATMOSPHERE WAS 270 TO 290 PARTS PER MILLION."



"BY 1984... IT WAS 340 PARTS PER MILLION! ie.... 17% TO 26% HIGHER!! A CO_2 INVENTORY OF OVER 700 BILLION TONNES!!! AND IT IS INCREASING AT THE RATE OF 1·2 ppm PER YEAR!!!!!"



"THIS INCREASE IN CO_2 CAN LEAD TO CLIMATIC CHANGES. THIS TRAPS INFRARED RADIATION IN THE LOWER ATMOSPHERE WHICH HEATS UP THE EARTH'S SURFACE!"

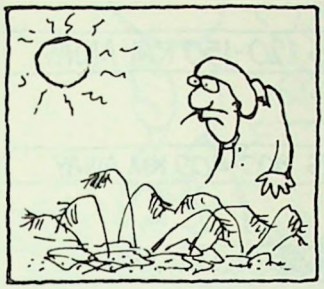


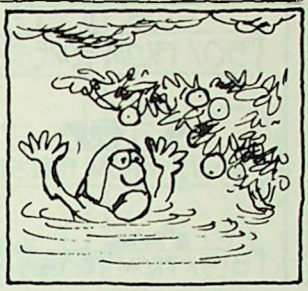
"THE HEATING WON'T BE UNIFORM OVER THE EARTH'S SURFACE! AT THE POLES IT MAY BE HIGHER IN THE FUTURE."

"THE ICECAPS COULD MELT... AVERAGE SEA LEVEL INCREASE... AND COASTAL AREAS COULD BE SUBMERGED!"

ALL THANKS TO... MAINLY THE HUGE THERMAL PLANT WHICH GENERATE ELECTRICITY, BURN FOSSIL FUELS AND INCREASE CO_2 IN THE ATMOSPHERE!

"ANOTHER RESULT OF THIS GLOBAL WARMING UP WOULD BE THAT RAINFALL PATTERNS WOULD CHANGE FROM AREA TO AREA AFFECTING CROPS... DIFFERENTLY!"





HOW SOON WOULD THIS OCCUR MA?

DEPENDS, SON, IN PART ON THE BURNING OF FOSSIL FUELS AND... THE NET REDUCTION OF THE GLOBAL BIOMASS, SINCE PLANTS ABSORB CARBON DIOXIDE!

"FOR HUNDREDS OF YEARS A BALANCE HAS BEEN MAINTAINED BY NATURE SINCE THE TREES ABSORB CO_2 AND RELEASE OXYGEN."

"BUT IT'S NOT THE SAME NOW!"

THE ALARMING RATE AT WHICH THE FORESTS ARE CUT DOWN IS HURTING THE BALANCE. SADLY... THE TREES ARE CUT TO MEET THE ENERGY NEEDS OF THE RURAL AS WELL AS THE URBAN PEOPLE.

ISN'T IT A WASTE TO CUT DOWN FORESTS FROM FAR OFF PLACES AND BRING THEM INTO THE CITIES, MA?

A BIG WASTE, YES, SON!

A STUDY* DONE OF THE FIREWOOD CONSUMPTION IN BANGALORE CITY SHOWED THAT IN ITS SUPPLY, TRANSPORTATION, DISTRIBUTION AND CONSUMPTION .....

*IN THE EARLY 1980'S

"THE AVERAGE MAGNITUDE OF FIREWOOD INVOLVED IN THESE FOUR PHASES OF THE FUEL CYCLE WAS 1197 ± 51 TONNES PER DAY!"

...ie ABOUT 0·44 MILLION TONNES PER YEAR!

CRUMBS!

"35% OF THIS TOTAL FIREWOOD CAME FROM FORESTS LOCATED WITHIN A RADIUS OF 30 TO 40 KM!"

"50% FROM FORESTS 120-150 KM. AWAY...

"6-7% FROM FORESTS 300-400 KM AWAY...

"8-9% FROM FORESTS 650-700 KM AWAY....

"...PRIVATE CONTRACTORS ACCOUNTED FOR 95% OF THE TOTAL SUPPLY!"

THE BALANCE, FOREST DEPT.!"

"85% WAS TRANSPORTED INTO THE CITY BY ROAD INVOLVING 114 TRUCKS/DAY!"

"...10% BY RAIL-10 WAGONS PER DAY!

REST...BY BULLOCK CARTS & HEAD-LOADS!"

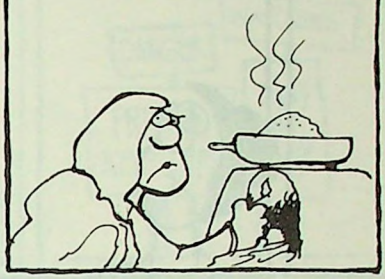
"HOUSEHOLDS ALONE ACCOUNTED FOR 78% OF THE TOTAL FIREWOOD CONSUMPTION...!"

"AND HOUSEHOLDS ALONG WITH..... DYEING FACTORIES, BAKERIES, HOTELS AND INDUSTRIES ... FOR 95% OF THE FIREWOOD USED IN BANGALORE!"

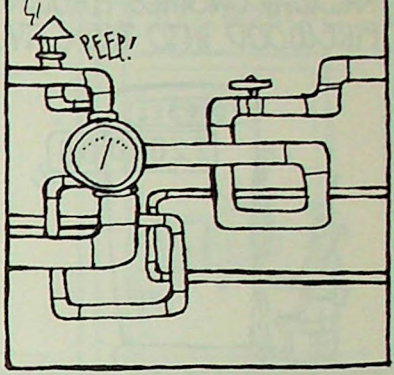
HOLY...SMOKE!

"OF THIS TOTAL FIREWOOD ABOUT 53% WAS USED FOR WATER HEATING!

...42% FOR COOKING!



...AND 5% FOR... INDUSTRIAL PROCESS HEAT!



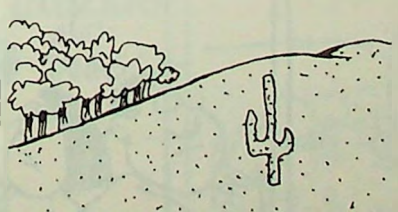
FOR THE WHOLE OF BANGALORE, DOMESTIC FIREWOOD CONSUMPTION-82% OF 970 TONNES PER DAY WAS ACCOUNTED FOR BY HOUSEHOLDS WITH A PER CAPITA INCOME OF LESS THAN Rs.200/MONTH!

EVEN THOUGH THIS INCOME CATEGORY CONSTITUTED ABOUT 60% OF.....THE... HOUSEHOLDS!"

THE BEST WAY TO REMEMBER ALL THIS IS TO... WRITE IT DOWN!

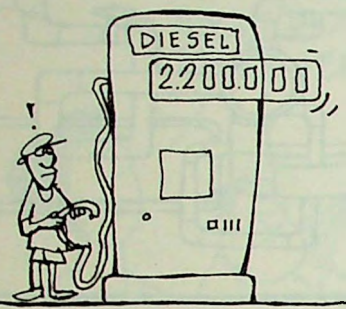
THE SUPPLY, TRANSPORTATION, DISTRIBUTION AND CONSUMPTION OF THIS PRESENT DAY...1200 TONNES PER DAY OF FIREWOOD IN BANGALORE... HAS IMPACTS ON.....

1: FORESTS. ABOUT 10 HECTARES HAVE TO BE CLEARED EVERY DAY TO MAINTAIN SUPPLY!



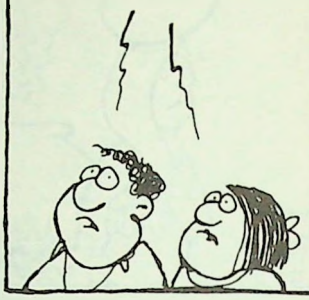
2: THE TRANSPORT SYSTEM. ABOUT 18% OF THE TRUCK TRAFFIC INTO BANGALORE AND 8% OF THE RAILWAY WAGON TRAFFIC ARE TIED UP WITH FIREWOOD TRANSPORT!

3: DIESEL CONSUMPTION. ABOUT 2·2 MILLION LITRES/YEAR REQUIRED TO RUN THE TRUCKS & RAILWAY ENGINES HAULING FIREWOOD INTO THE CITY!



4: FOREIGN EXCHANGE. ABOUT RUPEES..... 3,550,000! TO IMPORT THE DIESEL!

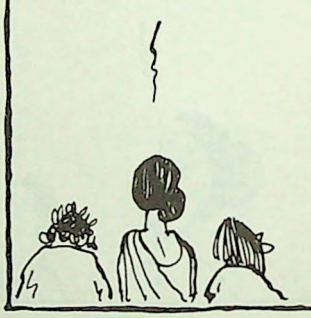
WHAT A TREMENDOUS WASTE!



IF EVERYBODY COULD HAVE ACCESS TO ELECTRICITY OR GAS...IT WOULD BE CHEAPER AND MORE CONVENIENT NO MA...?!

HOW MANY PEOPLE HAVE THE FINANCIAL SOURCE TO OBTAIN ACCESS TO THESE AMENITIES?!

ONLY... A FEW... CAN AFFORD THEM!



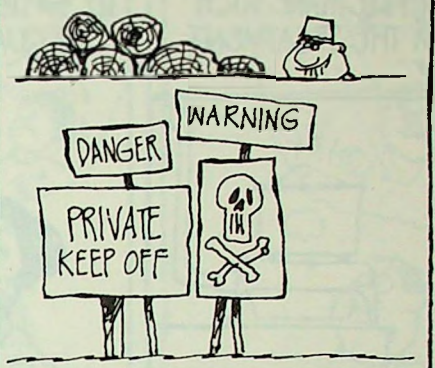
IT IS IN THAT SENSE THAT YOUR TEACHER WHEN SHE SPOKE ABOUT ENERGY AND DEVELOPMENT MEANT THAT THE FRUITS OF THIS HEAVY ENERGY INTENSIVE PATH OF DEVELOPMENT COULD ONLY BENEFIT A FEW PEOPLE!

IS IT NOT POSSIBLE TO DO SOMETHING ABOUT ALL THIS SO THAT THE POOR DO NOT HAVE TO SUFFER SO MUCH?

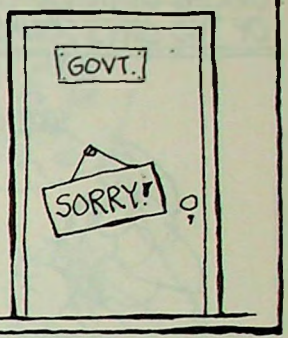
IT IS POSSIBLE!

"EXCEPT FOR THE GROWING OF FIREWOOD.....

...THE EXTRACTION, TRANSPORT AND DISTRIBUTION IS MAINLY IN PRIVATE HANDS...

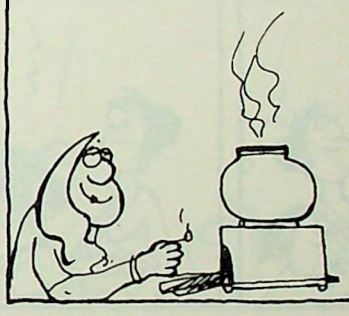


SO THE GOVERNMENT HAS LITTLE INFLUENCE OVER THESE ASPECTS OF THE PROBLEM!"

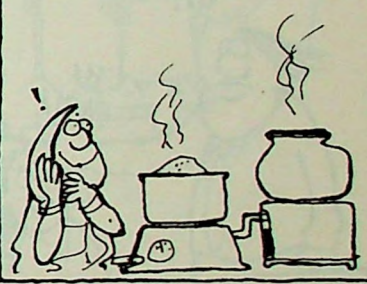


"SOLUTIONS MUST HENCE BE AIMED AT THE END USE OF ENERGY! IMMEDIATE... MEASURES COULD INCLUDE IMPROVED FIREWOOD STOVES FOR... COOKING!

...FOR WATER HEATING!!



...FOR ACHIEVING BOTH COOKING AND WATER HEATING IN A SINGLE DEVICE!!!"

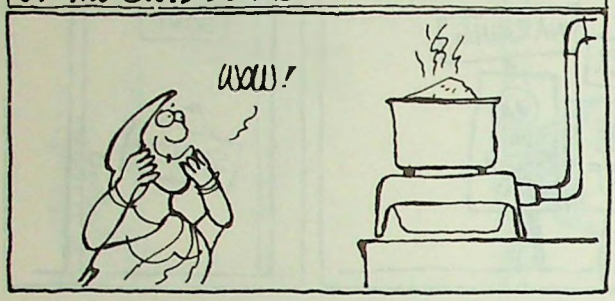


WHAT ABOUT SOLAR WATER HEATERS, MA?

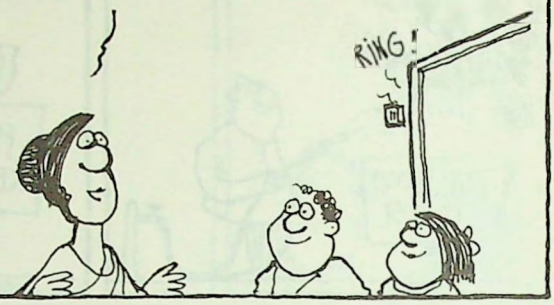
SURE! ESPECIALLY THOSE INEXPENSIVE BLACK-PLASTIC "WATER PILLOWS" WHICH ACT AS... COLLECTORS AND TANKS!

"ALSO LONG TERM MEASURES LIKE A 1 KM WIDE FOREST BELT AROUND BANGALORE'S PROPOSED 321 KM METROPOLITAN AREA... THIS COULD PROVIDE ITS FIREWOOD REQUIREMENT IN A SUSTAINABLE MANNER....."

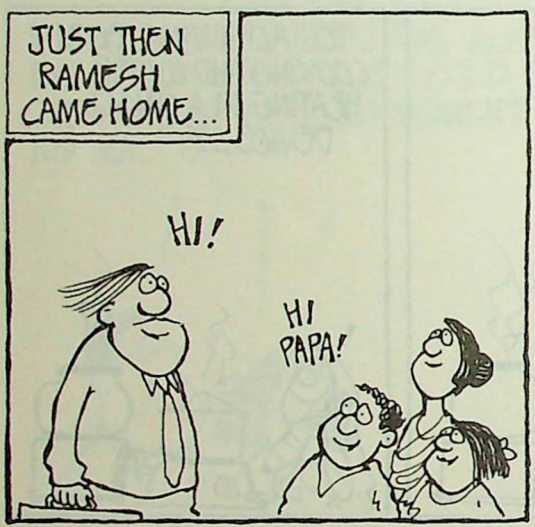
THIS FOREST BELT COULD PROVIDE ENERGY EITHER DIRECTLY OR AFTER GASIFICATION INTO PRODUCER GAS WHICH COULD BE PIPED INTO HOMES ALONG WITH METHANE RICH BIOGAS OBTAINED FROM THE TREATMENT OF THE CITY'S SEWAGE!"



HENCE THE BASIC SOLUTION TO THE ENVIRONMENTAL AND ENERGY PROBLEMS OF STRATIFIED SOCIETIES IS TO SATISFY BASIC NEEDS AND REMOVE INEQUALITIES!



JUST THEN RAMESH CAME HOME...

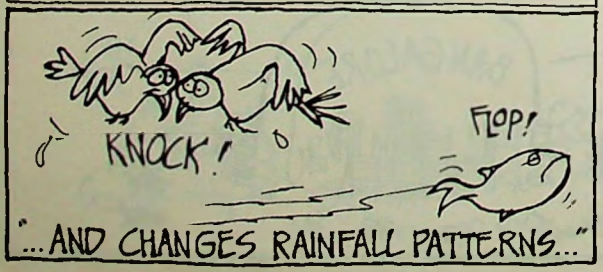


PAPA... WE'VE BEEN HAVING SUCH AN INTERESTING DISCUSSION ON ENERGY AND DEVELOPMENT AND...

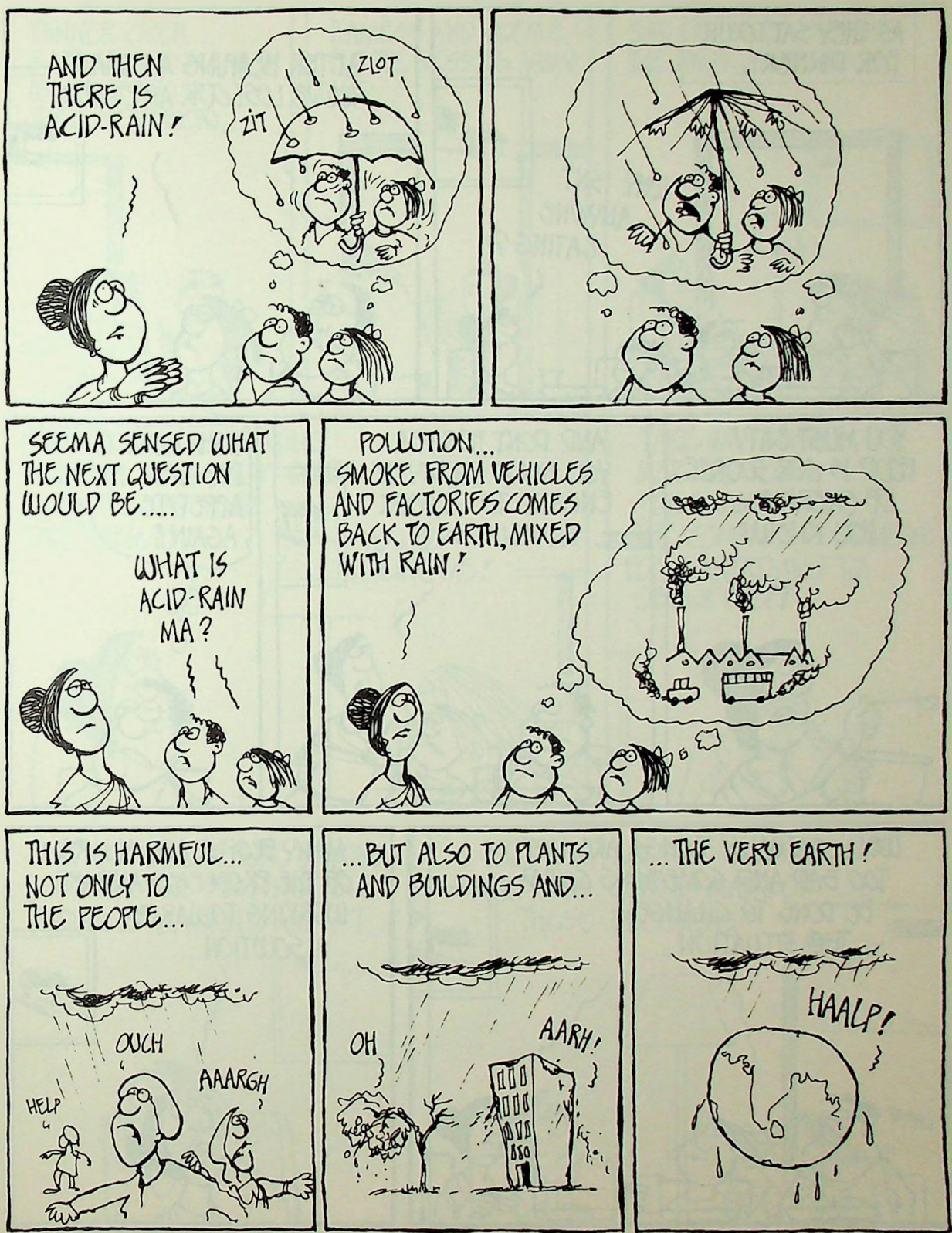
YOU CARRY ON! I NEED TO WASH AND CHANGE...

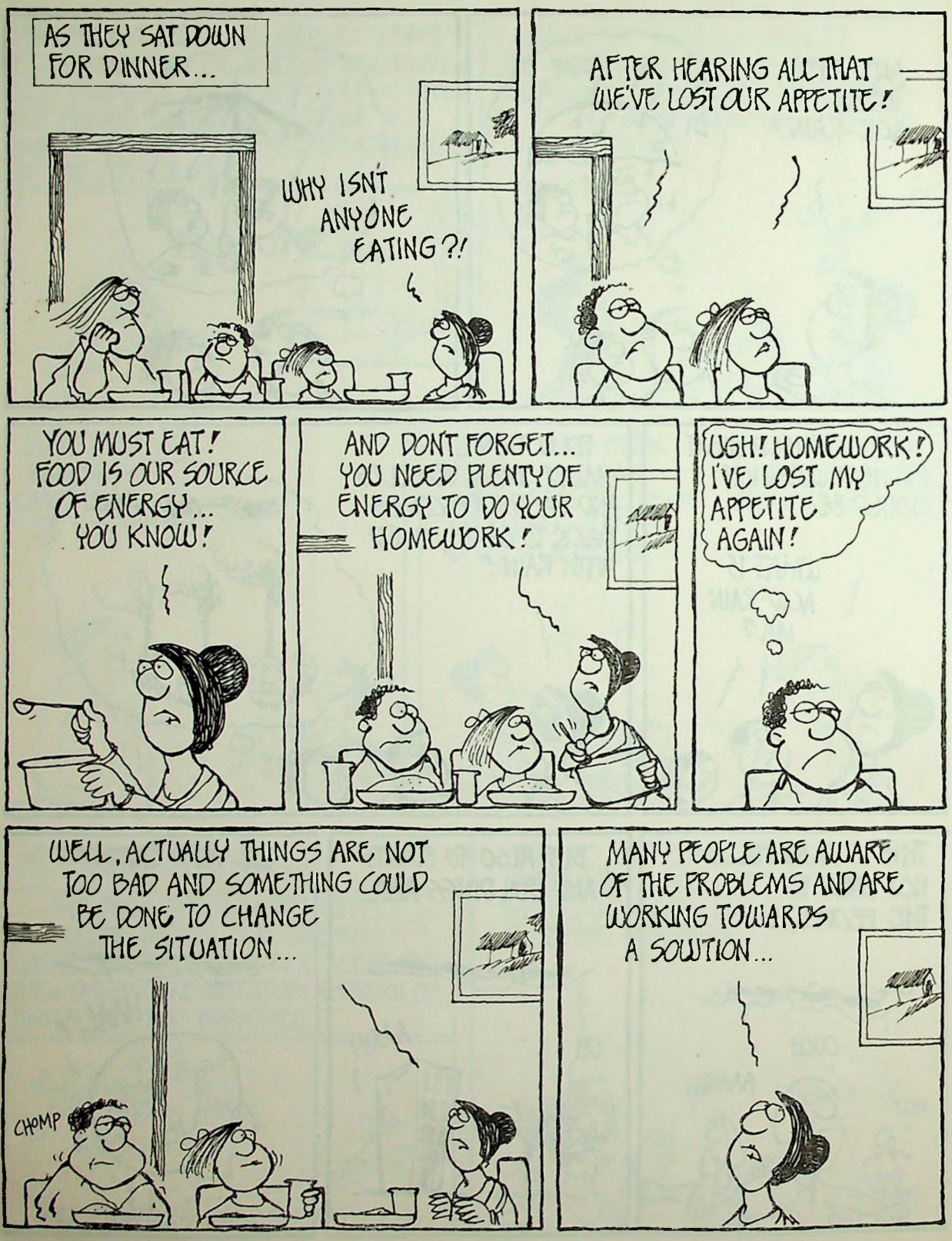
SO SEEMA CONTINUED.....

"...AND THEN THE HARMFUL EFFECT OF DEFORESTATION...SOIL EROSION... LARGE DAMS NOT JUST DISPLACE PEOPLE.. THEY DISRUPT THE MIGRATORY PATTERN OF BIRDS... DESTROY FISHERIES..."

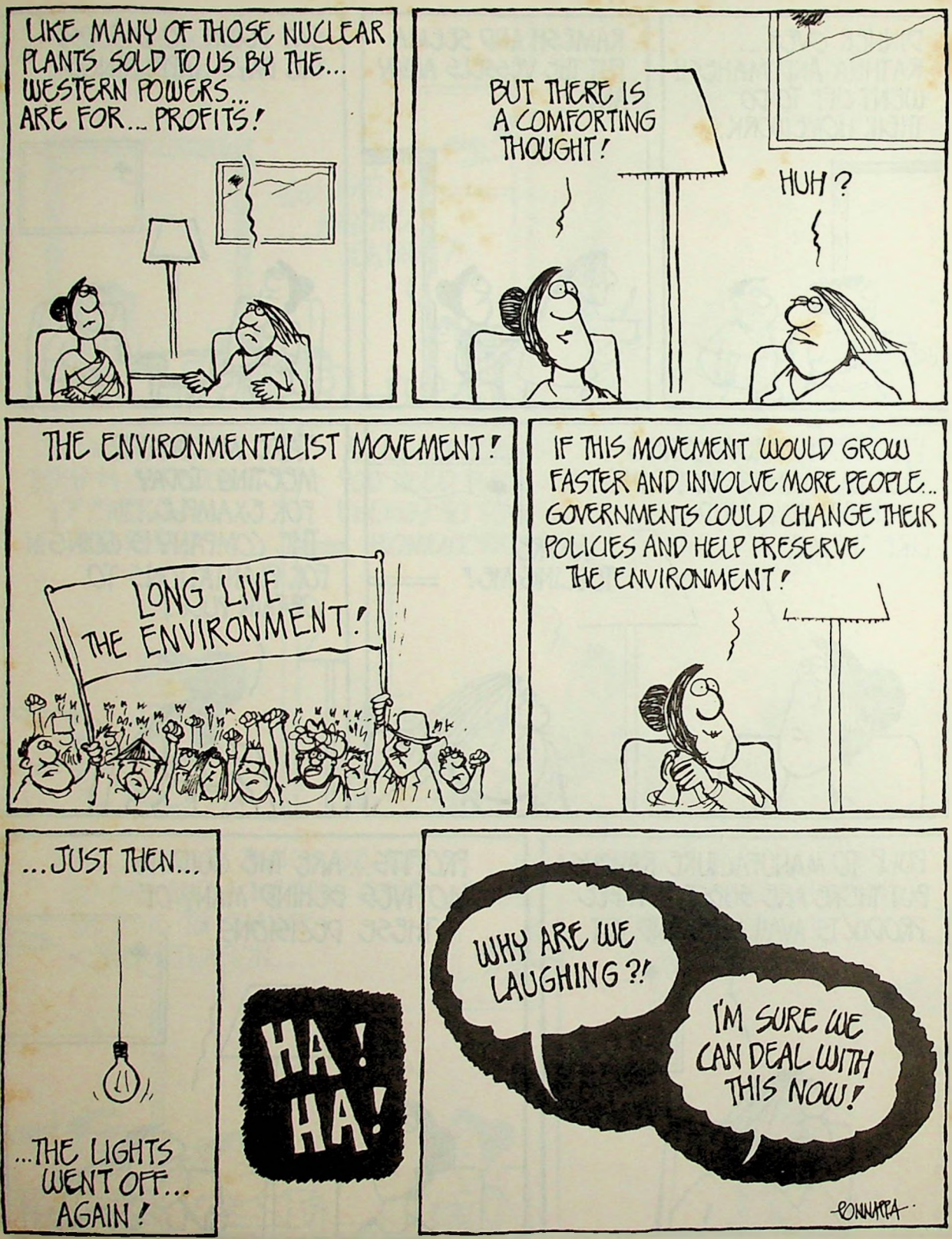


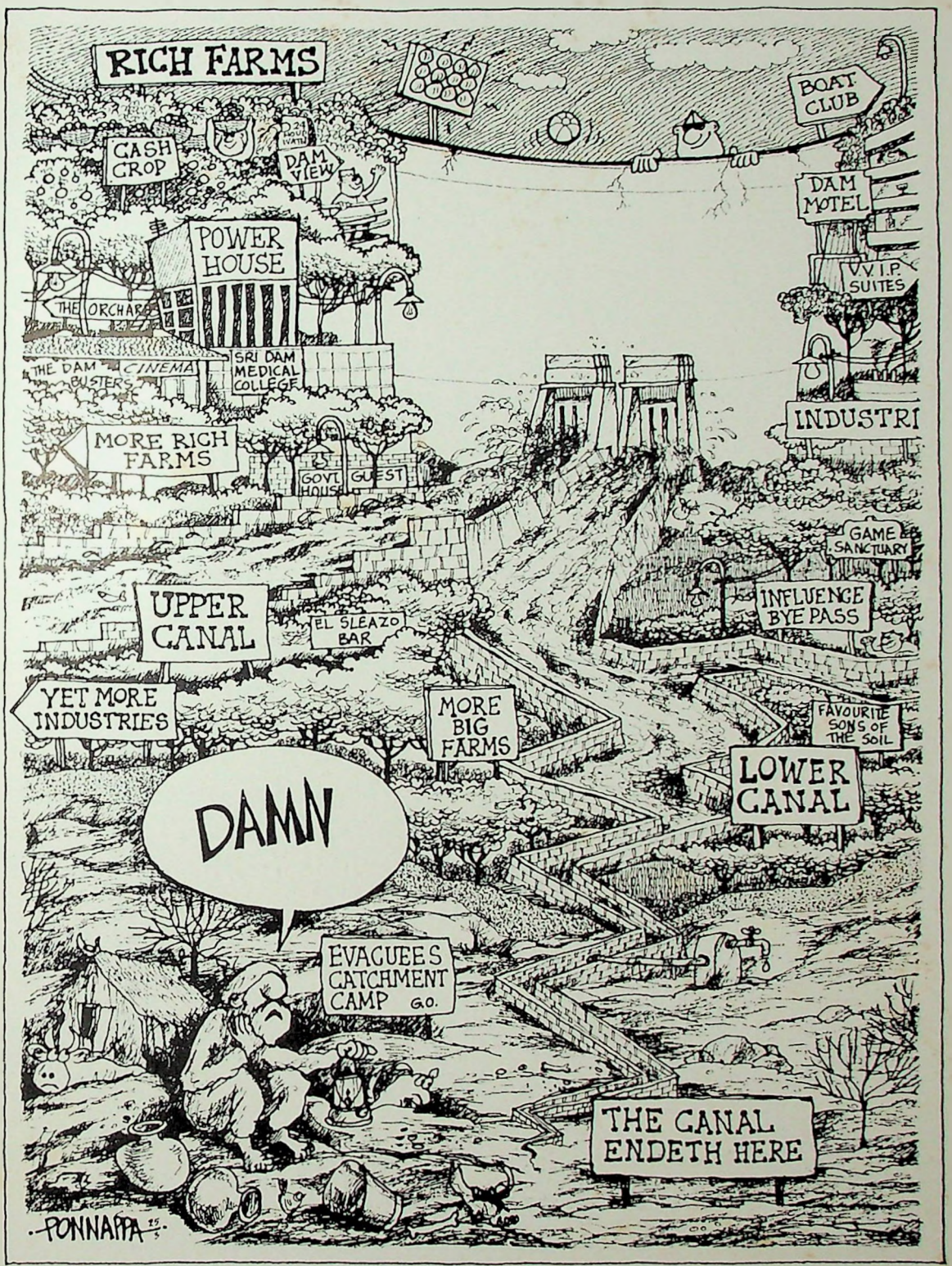
AND AID IN THE SPREAD OF WATERBORNE DESEASES SUCH AS SCHISTOSOMIASIS, MALARIA, SLEEPING SICKNESS...


AND THEN THERE IS ACID-RAIN!
ZIT
ZLOT
SEEMA SENSED WHAT THE NEXT QUESTION WOULD BE.....
WHAT IS ACID-RAIN MA?
POLLUTION... SMOKE FROM VEHICLES AND FACTORIES COMES BACK TO EARTH, MIXED WITH RAIN!
THIS IS HARMFUL... NOT ONLY TO THE PEOPLE...
OUCH
AAARGH
HELP
...BUT ALSO TO PLANTS AND BUILDINGS AND...
OH
AARH!
...THE VERY EARTH!
HAALP!


AS THEY SAT DOWN FOR DINNER...
WHY ISN'T ANYONE EATING?!
AFTER HEARING ALL THAT WE'VE LOST OUR APPETITE!
YOU MUST EAT! FOOD IS OUR SOURCE OF ENERGY... YOU KNOW!
AND DON'T FORGET... YOU NEED PLENTY OF ENERGY TO DO YOUR HOMEWORK!
UGH! HOMEWORK! I'VE LOST MY APPETITE AGAIN!
WELL, ACTUALLY THINGS ARE NOT TOO BAD AND SOMETHING COULD BE DONE TO CHANGE THE SITUATION...
CHOMP
MANY PEOPLE ARE AWARE OF THE PROBLEMS AND ARE WORKING TOWARDS A SOLUTION...


DINNER OVER... RATHNA AND MAHESH WENT OFF TO DO THEIR HOMEWORK.
RAMESH AND SEEMA PUT THE VESSELS AWAY AND...
...SAT DOWN TO DISCUSS THE DAY'S HAPPENINGS.
IT'S PRETTY FRUSTRATING Y'KNOW! THINGS JUST DON'T WORK THE WAY YOU'D LIKE THEM TO!
YOU'RE TELLING ME!
TAKE MY BOARD MEETING TODAY FOR EXAMPLE... THE COMPANY IS GOING IN FOR PLANTATIONS TO OBTAIN PULP!
PULP TO MANUFACTURE RAYONS! BUT THERE ARE SUBSTITUTABLE PRODUCTS AVAILABLE AND YET...!
PROFITS... ARE THE GUIDING MOTIVES BEHIND MANY OF THESE DECISIONS!


LIKE MANY OF THOSE NUCLEAR PLANTS SOLD TO US BY THE... WESTERN POWERS... ARE FOR... PROFITS!
BUT THERE IS A COMFORTING THOUGHT!
HUH?
THE ENVIRONMENTALIST MOVEMENT!
LONG LIVE THE ENVIRONMENT!
IF THIS MOVEMENT WOULD GROW FASTER AND INVOLVE MORE PEOPLE... GOVERNMENTS COULD CHANGE THEIR POLICIES AND HELP PRESERVE THE ENVIRONMENT!
...JUST THEN...
...THE LIGHTS WENT OFF... AGAIN!
HA! HA!
WHY ARE WE LAUGHING?!
I'M SURE WE CAN DEAL WITH THIS NOW!
PONNAPPA


RICH FARMS
BOAT CLUB
CASH CROP
DAM VIEW
DAM MOTEL
POWER HOUSE
V.V.I.P. SUITES
THE ORCHARD
THE DAM BUSTERS
CINEMA
SRI DAM MEDICAL COLLEGE
INDUSTRI
MORE RICH FARMS
GOVT GUEST HOUSE
GAME SANCTUARY
UPPER CANAL
EL SLEAZO BAR
INFLUENCE BYE PASS
YET MORE INDUSTRIES
MORE BIG FARMS
FAVOURITE SONS OF THE SOIL
LOWER CANAL
DAMN
EVACUEES CATCHMENT CAMP G.O.
THE CANAL ENDETH HERE
PONNAPPA

The End of Living and the Beginning of Survival

How can you buy or sell the sky, the warmth of the land? The idea is strange to us.

If we do not own the freshness of the air and the sparkle of the water, how can you buy them?

ALL SACRED

Every part of this earth is sacred to my people.

Every shining pine needle, every sandy shore, every mist in the dark woods, every clearing and humming insect is holy in the memory and experience of my people. The sap which courses through the trees carries the memories of the red man.

The white man's dead forget the country of their birth when they go to walk among the stars. Our dead never forget this beautiful earth, for it is the mother of the red man.

We are part of the earth and it is part of us.

The perfumed flowers are our sisters; the deer, the horse, the great eagle, these are our brothers.

The rocky crests, the juices in the meadows, the body heat of the pony, and man — all belong to the same family.

NOT EASY

So, when the Great Chief in Washington sends word that he wishes to buy our land, he asks much of us. The Great Chief sends word he will reserve us a place so that we can live comfortably to ourselves.

He will be our father and we will be his children. So we will consider your offer to buy our land.

But it will not be easy. For this land is sacred to us.

This shining water that moves in the streams and rivers is not just water but the blood of our ancestors.

If we sell you land, you must remember that it is sacred, and you must teach your children that it is sacred and that each ghostly reflection in the clear water of the lakes tells of events and memories in the life of my people.

The water's murmur is the voice of my father's father.

KINDNESS

The rivers are our brothers, they quench our thirst. The rivers carry our canoes, and feed our children. If we sell you our land, you must remember, and teach your children, that the rivers are our brothers, and yours, and you must henceforth give the rivers the kindness you would give any brother.

We know that the white man does not understand our ways. One portion of land is the same to him as the next, for he is a stranger who comes in the night and takes from the land whatever he needs.

The earth is not his brother, but his enemy, and when he has conquered it, he moves on.

He leaves his father's graves behind, and he does not care. He kidnaps the earth from his children, and he does not care.

His father's grave, and his children's birthright, are forgotten. He treats his mother, the earth, and his brother, the sky, as things to be bought, plundered, sold like sheep or bright beads.

His appetite will devour the earth and leave behind only a desert.

I do not know. Our ways are different from your ways.

The sight of your cities pains the eyes of the red man. But perhaps it is because the red man is a savage and does not understand.

There is no quiet place in the white man's cities. No place to hear the unfurling of leaves in spring, or the rustle of an insect's wings.

But perhaps it is because I am a savage and do not understand.

The clatter only seems to insult the ears. And what is there to life if a man cannot hear the lonely cry of the whip-poorwill or the arguments of the frogs around a pond at night? I am a red man and do not understand.

The Indian prefers the soft sound of the wind darting over the face of a pond, and the smell of the wind itself, cleaned by a midday rain, or scented with the pinon pine.

PRECIOUS

The air is precious to the red man, for all things share the same breath — the beast, the tree, the man, they all share the same breath.

The white man does not seem to notice the air he breathes. Like a man dying for many days, he is numb to the stench.

But if we sell you our land, you must remember that the air is precious to us, that the air shares its spirit with all the life it supports. The wind that gave our grandfather his first breath also receives his last sigh.

And if we sell you land, you must keep it apart and sacred, as a place where even the white man can go to taste the wind that is sweetened by the meadow's flowers.

ONE CONDITION

So we will consider your offer to buy our land. If we decide to accept, I will make one condition: The white man must treat the beasts of this land as his brothers.

I am a savage and I do not understand any other way.

I have seen a thousand rotting buffaloes on the prairie, left by the white man who shot them from a passing train.

I am a savage and I do not understand how the smoking iron horse can be more important than the buffalo that we kill only to stay alive.

What is man without the beasts? If all the beasts were gone, man would die from a great loneliness of spirit.

For whatever happens to the beasts, soon happens to man. All things are connected.

THE ASHES

You must teach your children that the ground beneath their feet is the ashes of your grandfathers. So that they will respect the land, tell your children that the earth is rich with the lives of our kin.

Teach your children what we have taught our children, that the earth is our mother.

Whatever befalls the earth befalls the sons of the earth. If men spit upon the ground, they spit upon themselves.

This we know: The earth does not belong to man; man belongs to the earth. This we know.

All things are connected like the blood which unites one family. All things are connected.

Whatever befalls the earth befalls the sons of the earth. Man did not weave the web of life: he is merely a strand in it. Whatever he does to the web, he does to himself.

Even the white man, whose God walks and talks with him as friend to friend, cannot be exempt from the common destiny.

We may be brothers after all.

We shall see.

One thing we know, which the white man may one day discover — our God is the same God.

You may think now that you own Him as you wish to own our land; but you cannot. He is the God of man, and His compassion is equal for the red man and the white.

This earth is precious to Him, and to harm the earth is to heap contempt on its Creator.

The whites too shall pass; perhaps sooner than all other tribes. Contaminate your bed, and you will one night suffocate in your own waste.

But in your perishing you will shine brightly, fired by the strength of the God who brought you to this land and for some special purpose gave you dominion over this land and over the red man.

That destiny is a mystery to us, for we do not understand when the buffalo are all slaughtered, the wild horses are tamed, the secret corners of the forest heavy with scent of many men, and the view of the ripe hills blotted by talking wires.

Where is the thicket? Gone.

Where is the eagle? Gone.

The end of living and the beginning of survival.

In 1854, the "Great White Chief" in Washington made an offer for a large area of Indian land and promised a 'reservation' for the Indian people. Chief Seattle's reply, published here in full, has been described as the most beautiful and profound statement on the environment ever made.