



Reliance
Industries Limited

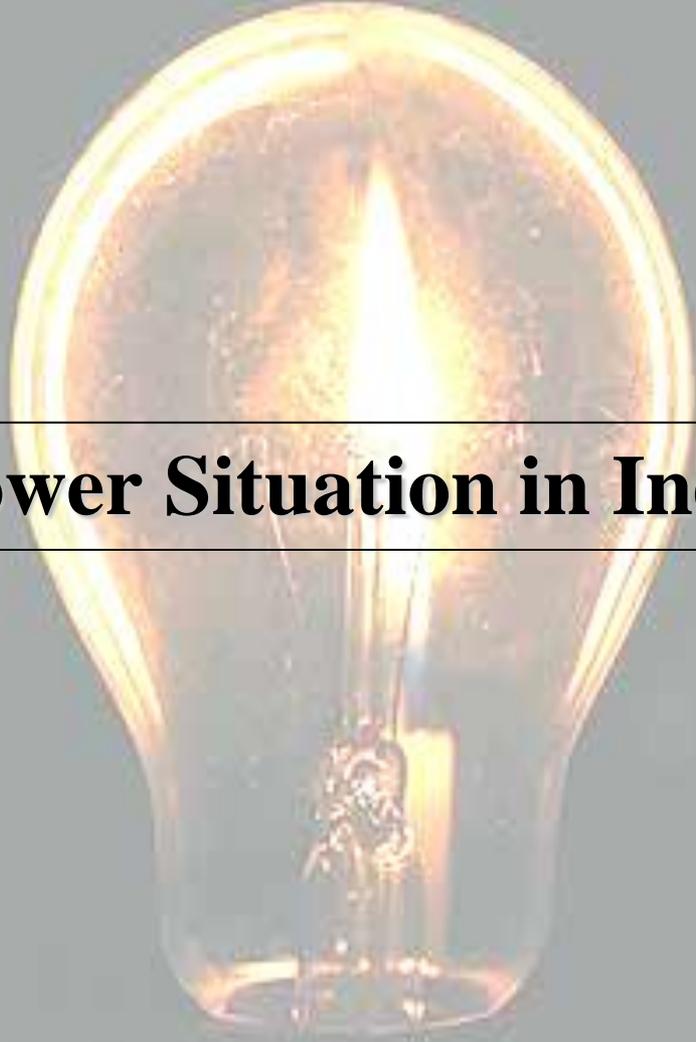
Plastics : “Green” Construction Materials

S. S. Naik

**Reliance Industries Ltd.
Mumbai**

- ✚ **Power Situation India**
- ✚ **Green Buildings**
- ✚ **Plastics – A friend Indeed**
- ✚ **Plastics in Building and Construction**
- ✚ **Plastics in Energy Conservation**
- ✚ **Plastics Pipes in Water Efficiency**
- ✚ **Plastics for resource Management**
- ✚ **Plastics For Waste Management**
- ✚ **The Way Of Green Future**





Power Situation in India

- ❑ Energy efficiency
- ❑ Reduced use of fossil fuel
- ❑ Water efficiency
- ❑ Handling of household waste
- ❑ Health and well being of occupants
- ❑ Reduced dependency on virgin materials

Green Building – Addressing the National Priorities

Present Situation

- ❑ Total Installed Capacity : 185496 MW
- ❑ Power Shortage ~ 10% (average)
- ❑ ~ 13.5% (Peak)
- ❑ T & D Losses : 30 – 45%
- ❑ Half of rural households still do not have access to electricity
- ❑ One of the lowest per capita consumption of electricity(600kWH)



Solution

- ❑ New generation (Govt. & PPP) – a highly capital intensive proposition
- ❑ Reduce aggregate techno-commercial losses
- ❑ Demand side management

Vision – Energy Independent India by 2035





Green Buildings

Green Building – The Concept

- Reducing operating costs by increasing productivity and using less energy and water



- Improved public and occupant health due to improved air quality

- Reduced environmental impacts by lowering storm water run-off and the heat island effect



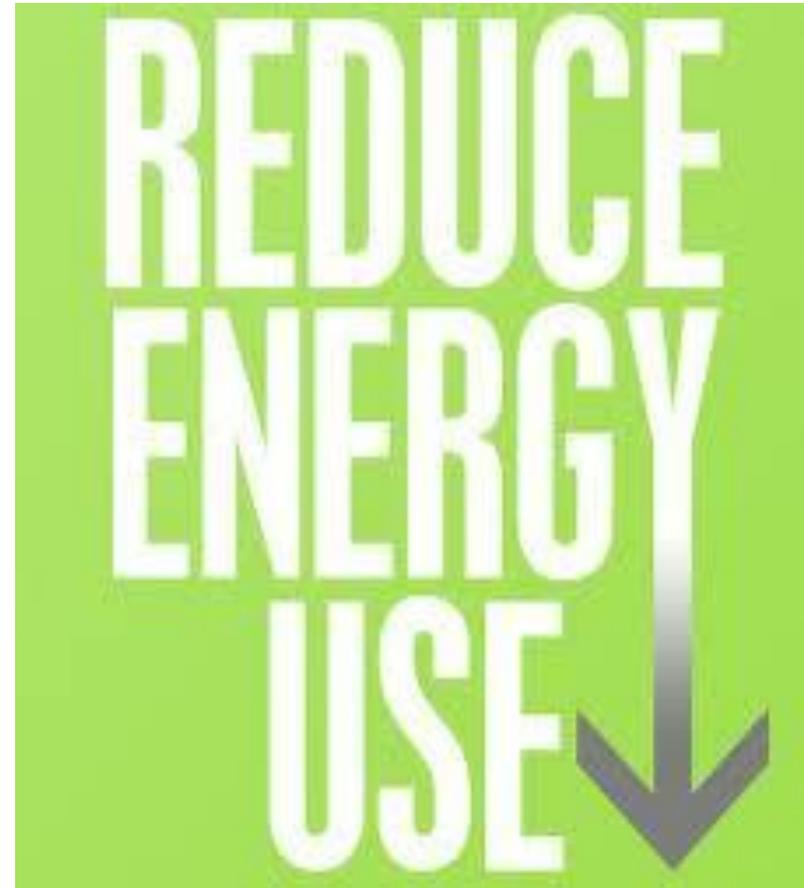
To achieve not only ecological balance but aesthetic harmony

Need a Complete Paradigm Shift....



How to Reduce Energy Consumption?

- ❑ **To increase efficiency of the building envelop**
 - ❑ **Use high efficiency windows and insulation in walls, ceilings and floors.**
 - ❑ **Passive solar building design**
 - ❑ **Effective window placement (day lighting) can provide more natural light**
 - ❑ **Solar water heating**
 - ❑ **Insulation to pipes and ducts of heating and cooling systems**
 - ❑ **Use of fluorescent lighting**
 - ❑ **Finally onsite generation of renewable energy through solar, wind, hydro power or biomass.**

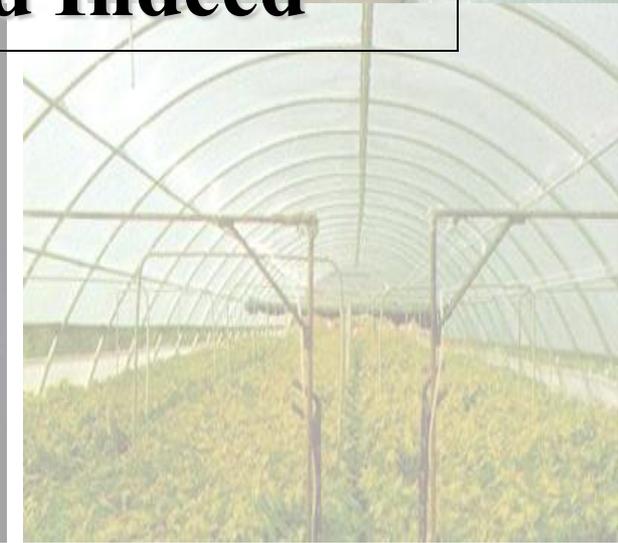


Use Energy Efficient Plastics

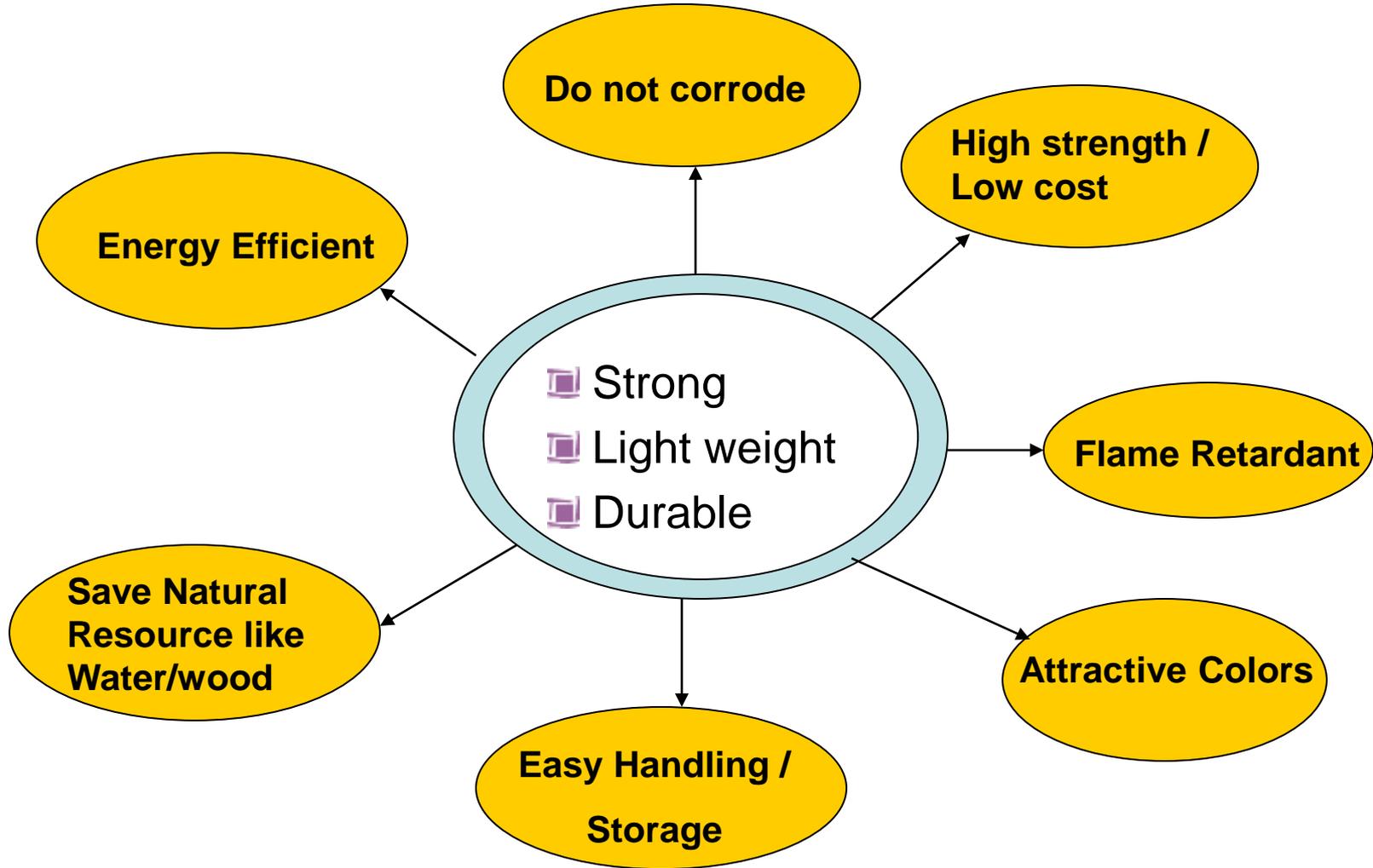




Plastics :A Friend Indeed



Why Plastics.....

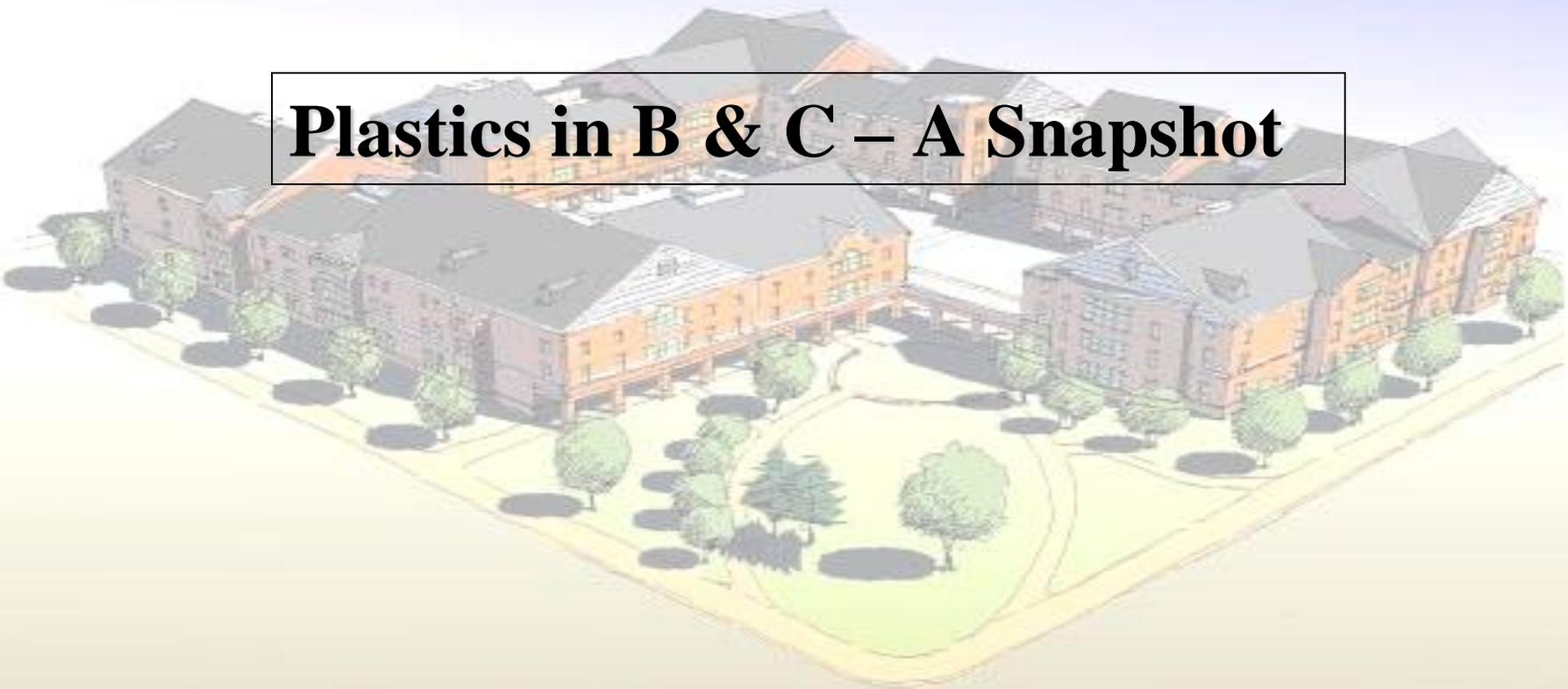


At Much Lower Cost !!!!!

Sustainability of Plastics

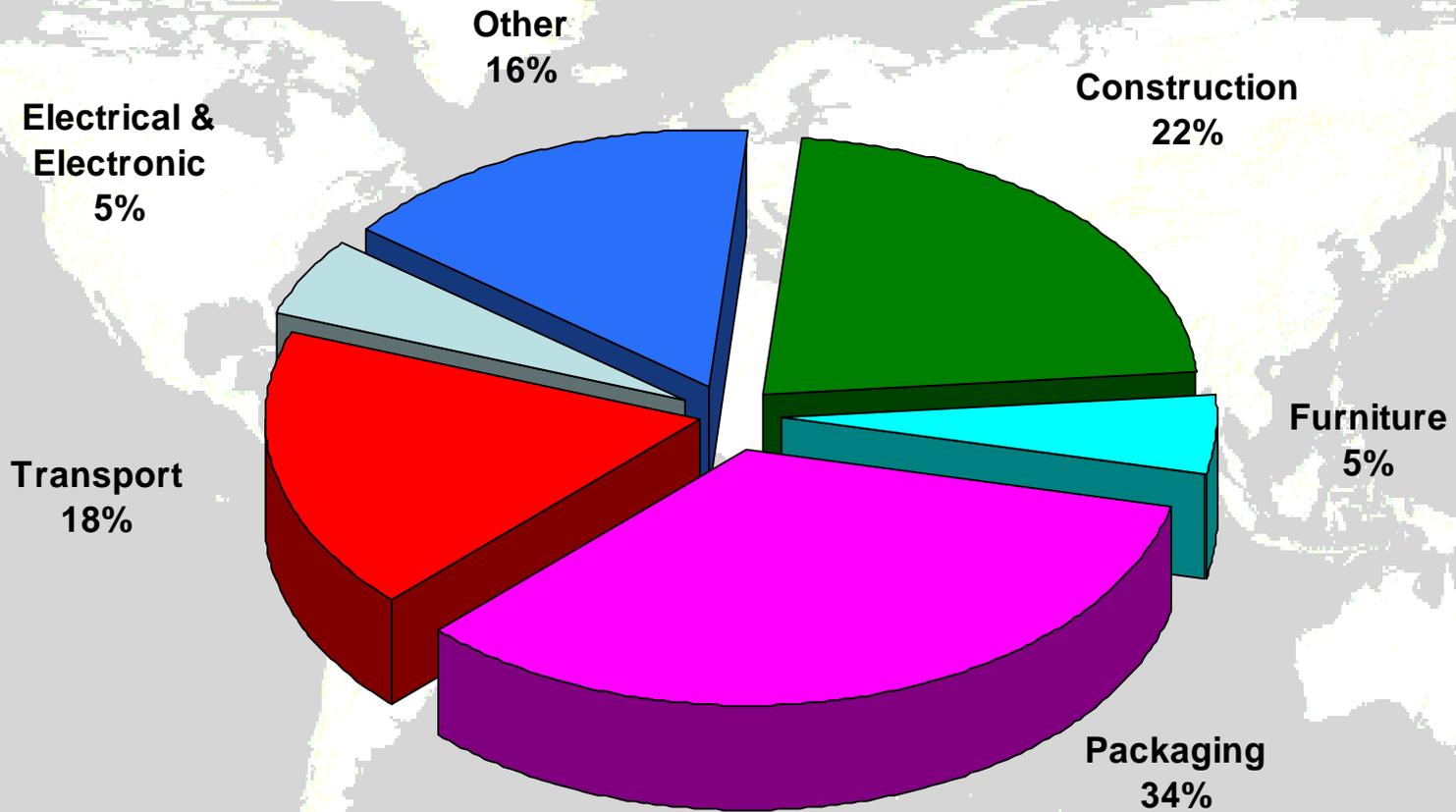


- ❑ **Energy efficient materials – utilize less energy at Raw material manufacturing, production, transportation and installation stages**
- ❑ **Material use – Saving of natural resources through recycling.**
- ❑ **Low emission processes – low GHG production during manufacturing and usage**
- ❑ **Low waste production – durable and recyclable**
- ❑ **Economic recovery – plastics can be recycled or used to regain intermediate raw materials or used for thermal recovery through incineration.**
- ❑ **Disposal of residues – due to recyclability put less burden for disposal**



Plastics in B & C – A Snapshot

Plastics - Global End Use Markets



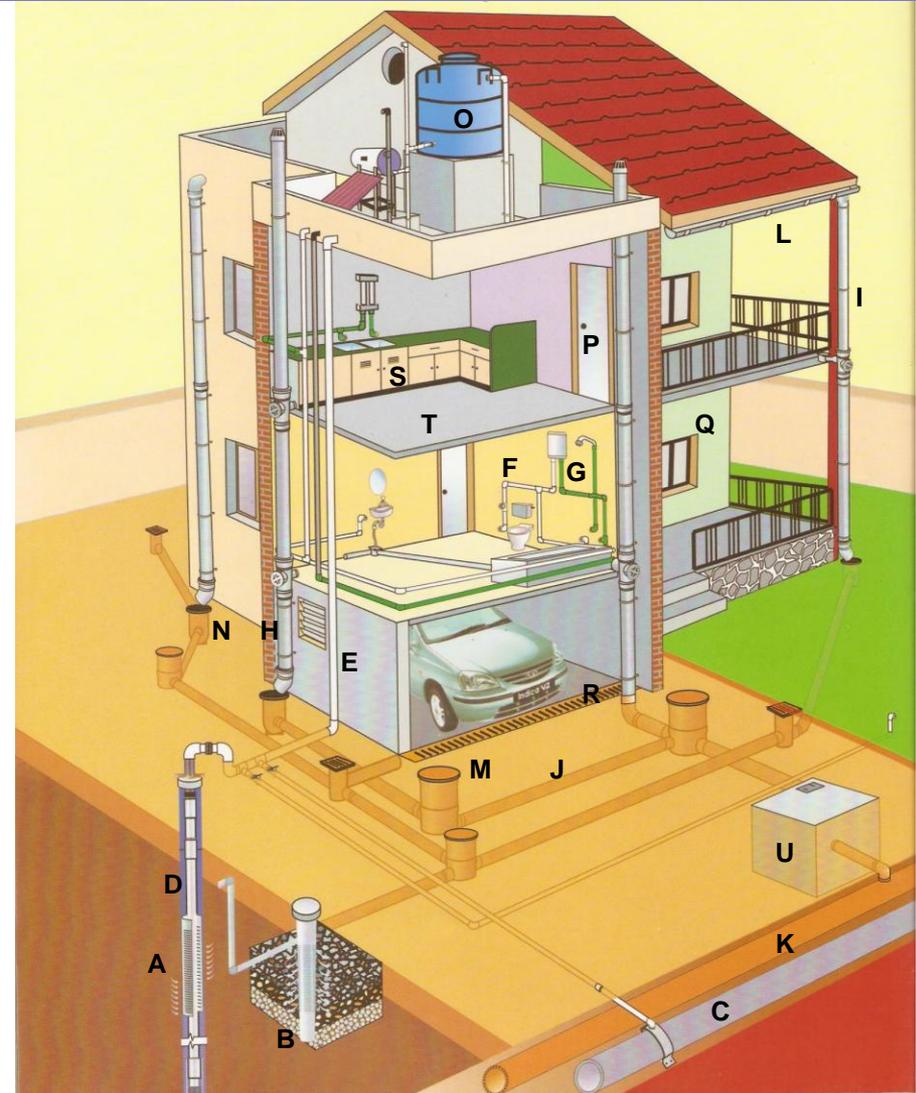
Total Global Cons ~171 MMT

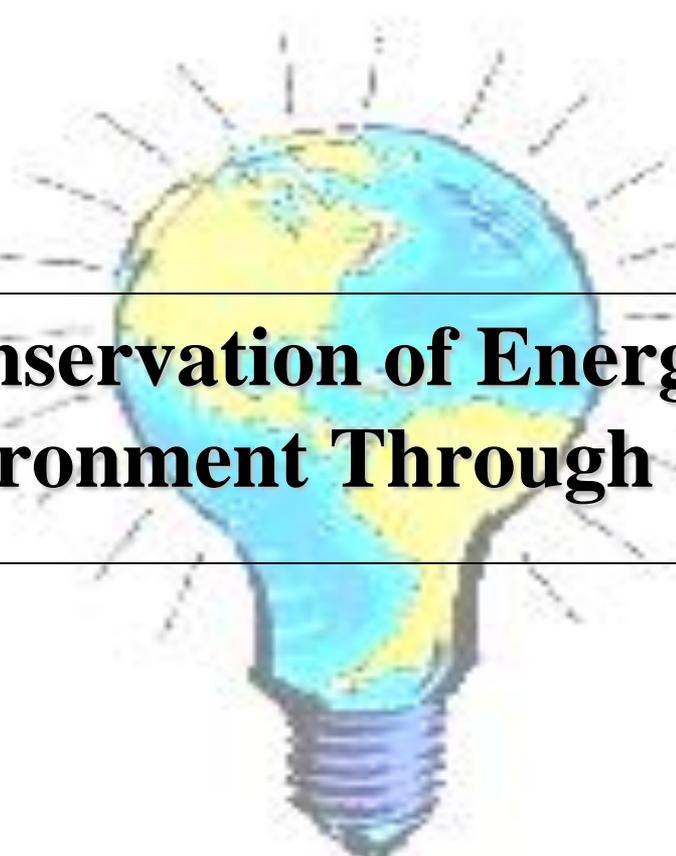
Source:AJI-Europe

B&C- Second largest Plastics End-Use segment

Plastic Products in a Building

A, B pumps)	: Casing Pipe (for tube well / hand
D	: Riser Pipe
C, E	: Water Supply lines.
F	: PVC Plumbing pipes
G	: PP-R Plumbing pipes
H, L	: SWR pipes
I	: Rain Water Pipe
J & K	: Sewerage Pipes
L	: Gutter for rain water harvesting
M	: Inspection Chamber
N	: Gully trap
O	: Water storage tank
P	: Door
Q	: Window
R	: Grating
S	: PVC Furniture
T	: PVC Flooring
U	: Septic Tank

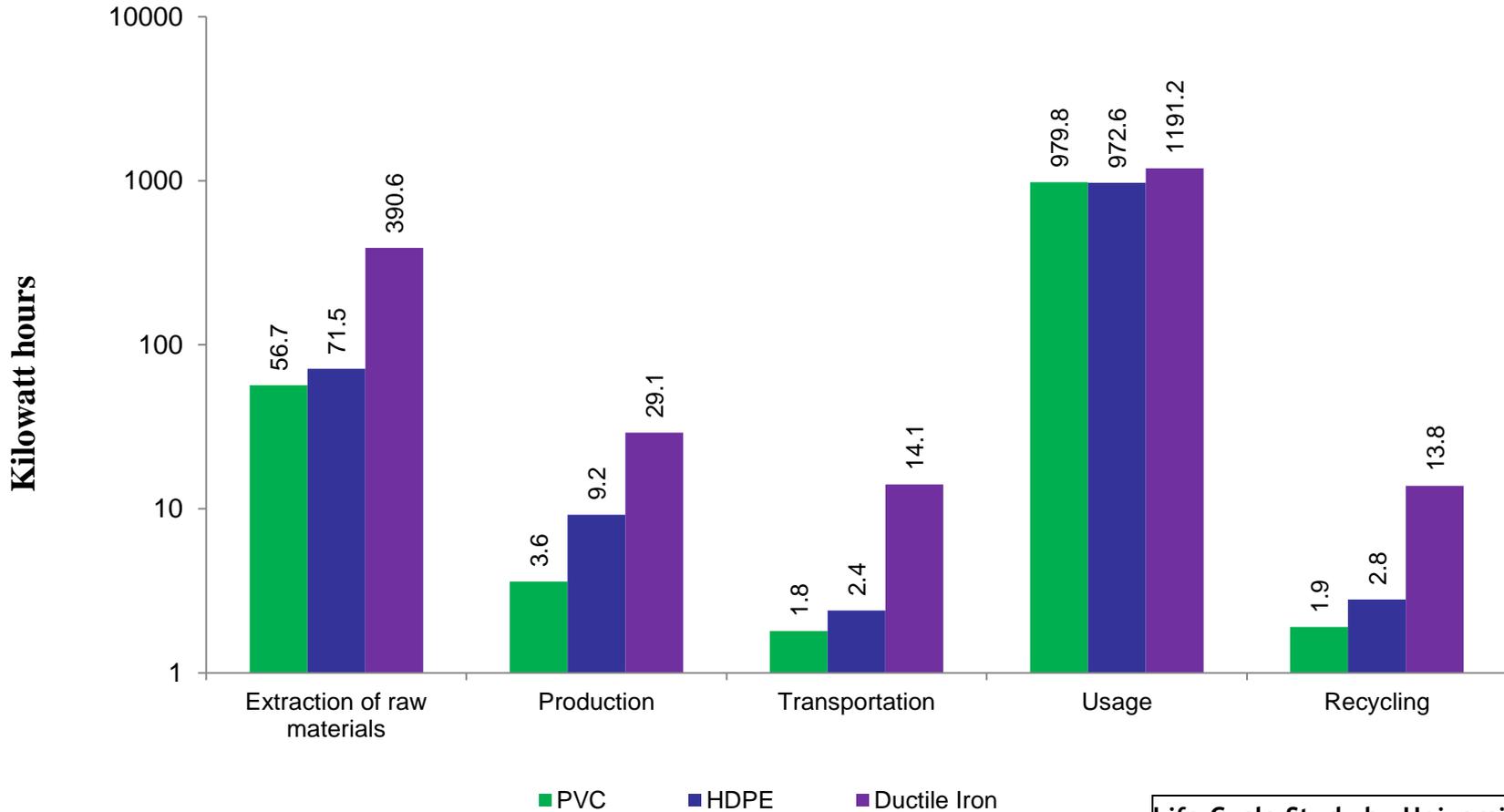




**Conservation of Energy and
Environment Through Plastics**

EVERY WATT COUNTS

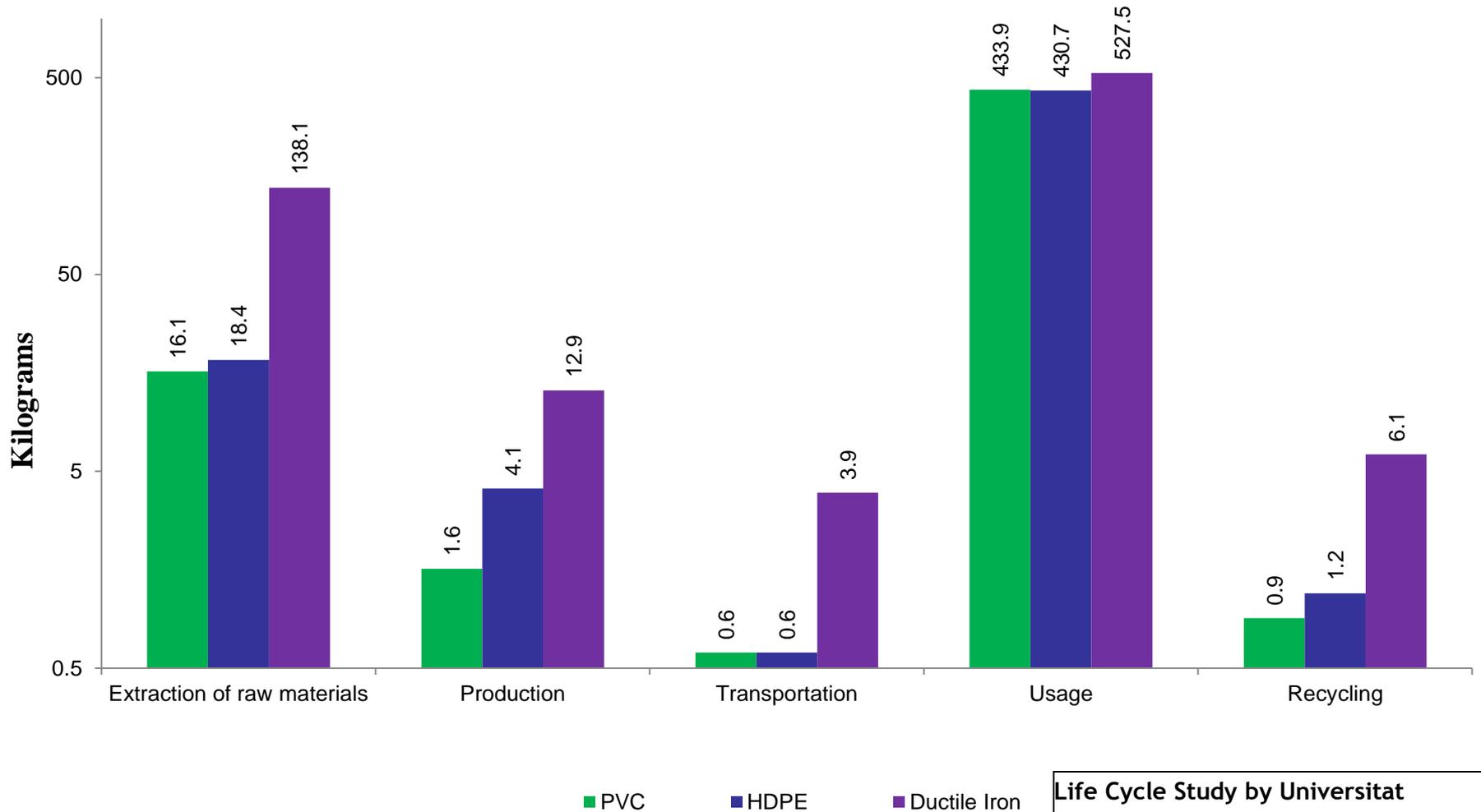
Energy Efficiency through Plastic Pipes



Life Cycle Study by Universitat
Politecnica De Catalunya, Barcelona

Pipe diameters considered are PVC -110 mm, HDPE – 125 mm and DI – 125 mm to maintain same flow rate in all three pipelines
Energy requirement values given are calculated for 3 meter length for all pipes (10 Kg pressure rating)

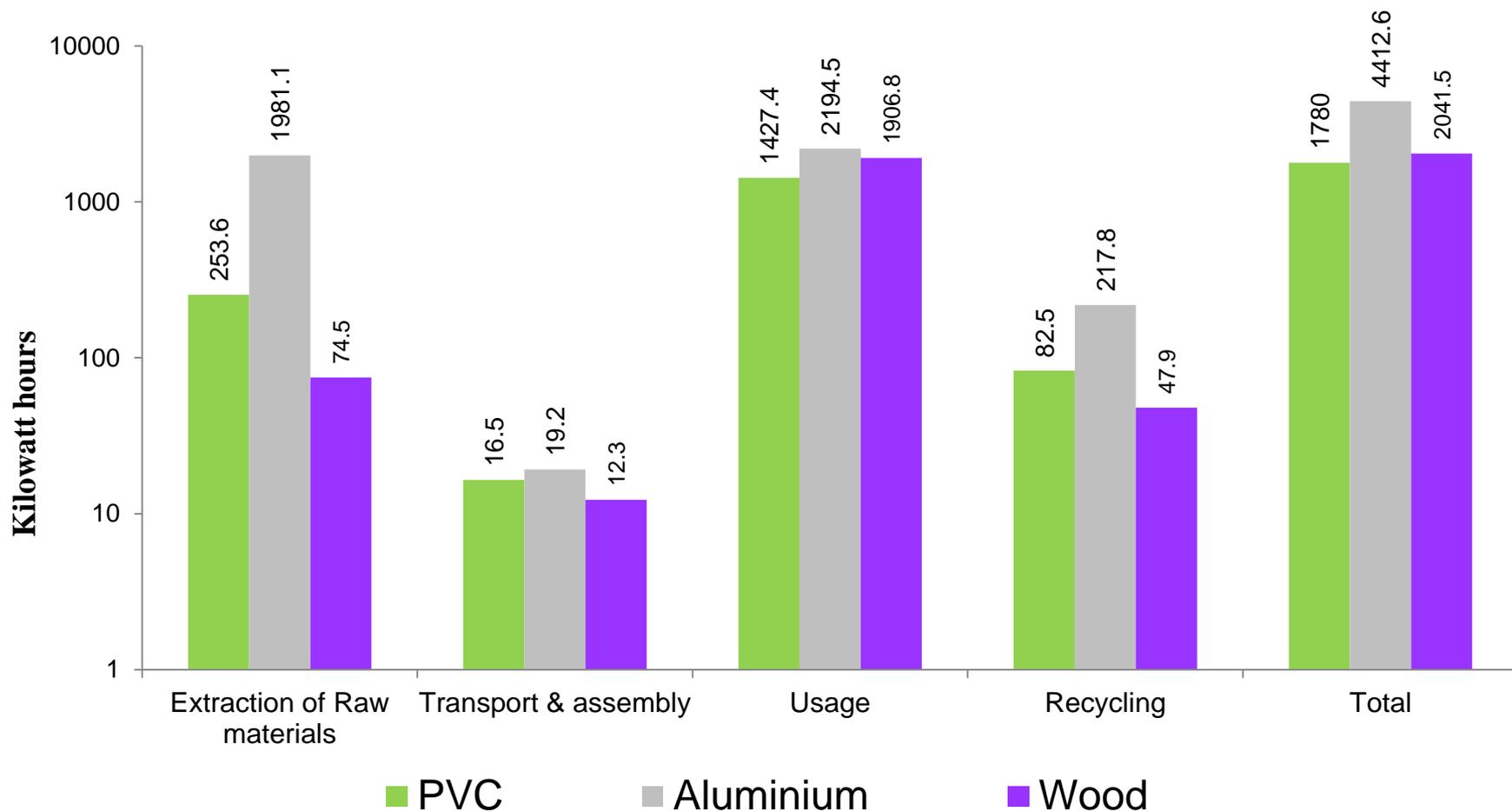
Plastic Pipes – Reduction in GHG emission



Life Cycle Study by Universitat
Politecnica De Catalunya, Barcelona

Pipe diameters considered are PVC -110 mm, HDPE – 125 mm and DI – 125 mm to maintain same flow rate in all three pipelines
CO2 emission values given are calculated for 3 meter length for all pipes (10 Kg pressure rating).

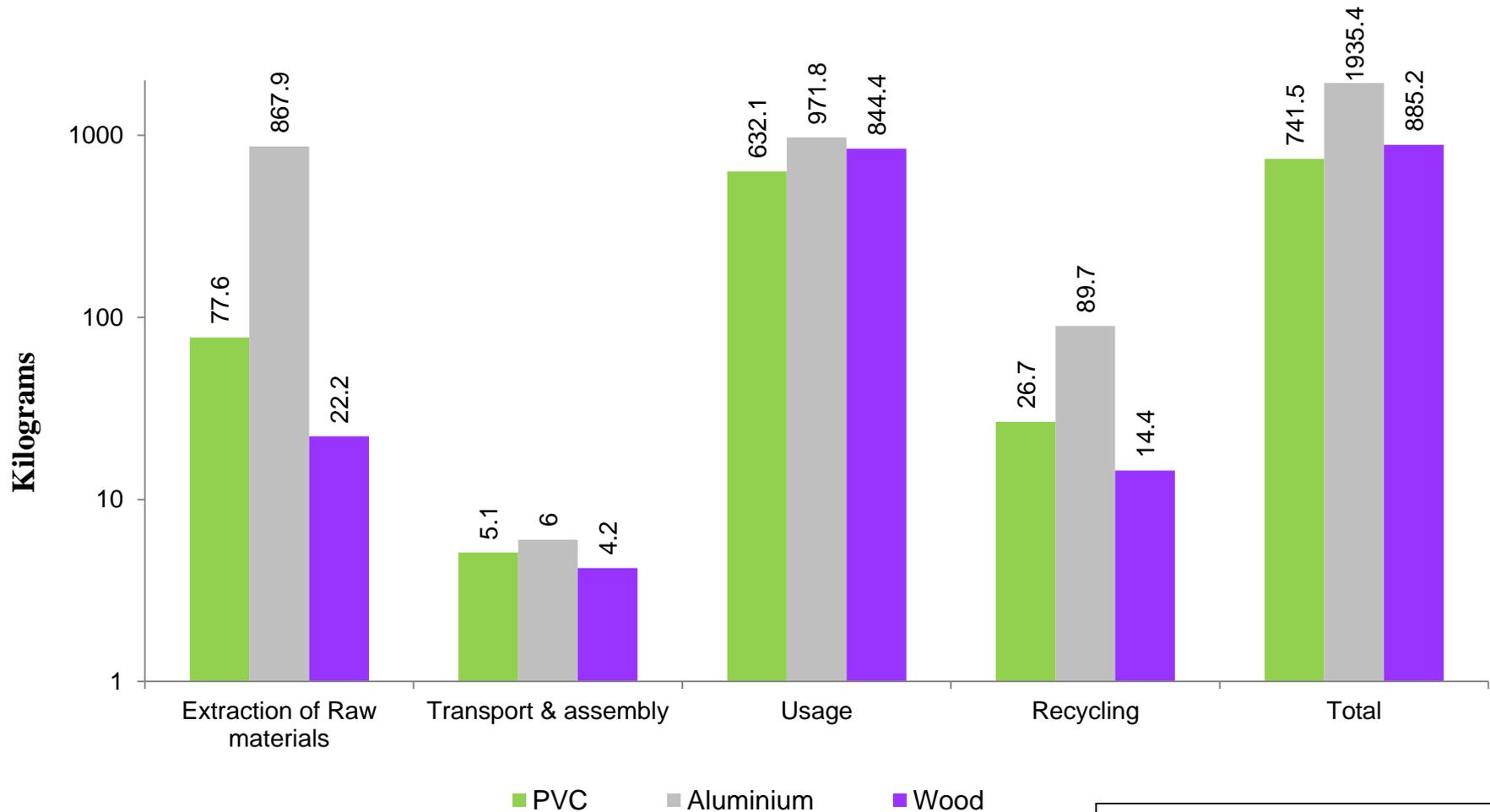
u PVC Windows - Energy Saving Proposition



Life Cycle Study by Universitat
Politecnica De Catalunya, Barcelona

PVC and Aluminium Windows considered for calculation measuring 1.34 meter X 1.34 meter .
Energy values are calculated for one window of PVC & Aluminium

u PVC Windows – Reduction in GHG emission



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PVC and Aluminium Windows considered for calculation measuring 1.34 meter X 1.34 meter .
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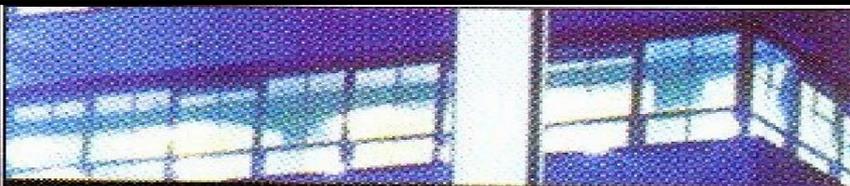
Energy Saving Case Study 1- Hotel Taj Blue Diamond

	Elgi – Infinity(RTVP) Windows	Replaced Aluminum Windows
No. of windows (Guest rooms)	58	58
Glazing configuration	6 + 12 + 6 (Clear)	6mm clear
Area of one window	=7.45 Sq.M	7.45 Sq.M
Glass area	=6.16 Sq.M	6.83 Sq.M
Frame area	=1.29 Sq.M	0.62 Sq.M
Relative heat gain (RHG) through glass	=567 W/m² x 6.16m² =3492.72W	663W/m² x 6.83 m² =4528.29 W
Direct energy transfer (DET) through frame	=1.4 W/m².K x 8 K x 1.29m² =14.44 W	16 W/m².K x 8 K x .62m² =79.36 W
Total heat gain	=3492.72 W +14.44 W =3507.16W i.e.3.51 KW	4528 W + 79.36 W =4607.65W i.e.4.61 KW
For 58 windows	3.51 KW x 58 =203.58 KW	4.61KW x 58 =261.38 KW
Assuming, 10 hours of a/c usage per day and 80 % occupancy rate: Annual usage	10 x 365 x 80/100 =2920 hours	10 x 365 x 80/100 =2920 hours
Annual power consumption to compensate the heat gain	203.58 KW x 2920 hr. =594454 KWhr.	261.38 KW x 2920 hr. =763230 KWhr.

***Savings ~ 1, 60,000 KWh**

Energy Saving Case Study 2 - IIT Delhi

- Location : IIT Delhi
- Floor area - 1000Sqft
- window area - 300Sqft
- Initial Cost- Conventional: Rs 175/Sqft ; PVC double glazed: Rs 235/ Sqft
- Increase in initial cost - Rs 18000/-
- Power saving - About 4350 units / annum
- Total saving - About Rs 15000 p.a.



ऊर्जा बर्बाद स्थितियों

विद्युत्कियों से ग्रहण आती है जो रोशनी और गर्मी देती है इसलिये ऊर्जा-दाय इमारतों में विद्युत्कियों का बहुत महत्व है। एल्युमिनियम या स्टील के फ्रेम वाली विद्युत्कियों की तुलना में पी वी सी (पॉली विनाइल क्लोराइड) का फ्रेम, दुबरी कांच की परत और जड़े हुये विद्युत् फ्रेम, तथा खुली जगहों को खींच सही मासकट लगाने से ऊर्जा की अच्छी बचत होती है।

नयी दिल्ली में इंडियन इन्स्टीट्यूट ऑफ टेक्नोलॉजी द्वारा किये गये अध्ययन से पता चला है कि अगर विद्युत् की मासकट 5 रु. प्रति यूनिट की दर से लगाये तो खर्च साल भर में ही वापस हो जाता है। नये की गयी खर्चा में 735 वर्ग मीटर वाली इमारत में 30 प्रतिशत विद्युत्कियों पर विद्युत् की बचत का हिसाब दिया गया है।

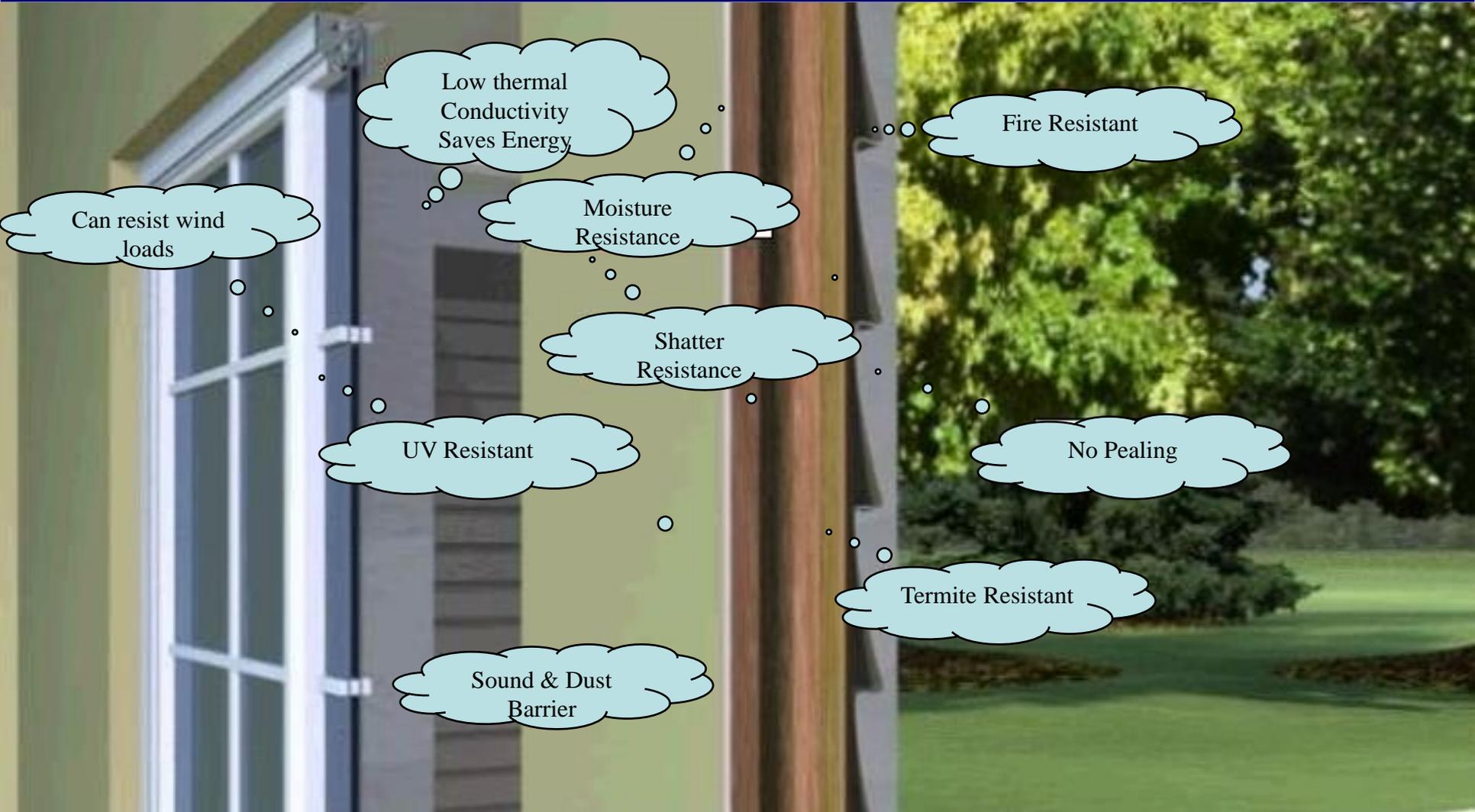
प्रकार	पी वी सी विद्युत्कियों में ऊर्जा की बचत (किग्वॉट/वर्ष)	अतिरिक्त खर्च 800 रु./ वर्ग मीटर	प्रति यूनिट ऊर्जा की लागत
पॉली	34,545	1,76,400	1 रुप
वेनर	49,080	1,76,400	8 रुपये

5 रु प्रति यूनिट विद्युत् की दर से एक साल में खर्च वापस हो जाती है।

PVC windows substitute of Aluminum
(Source: Bureau of Energy Efficiency (BEE) leaflet)



PVC Windows & Doors



No other material can fulfill all these requirements

PVC Windows & Doors material of choice across the World

Geography	Aluminum(%)	MS(%)	Timber(%)	PVC(%)
Europe	22		12	66
Russia	10		24	66
Latin America	76		18	6
North America	7	4	27	62
China	50			50
Turkey	20		15	65
India	45	24	25	7



Also used extensively in Gulf, Thailand, Indonesia Malaysia, S.Korea, Taiwan, Iran, Vietnam

Projects with uPVC Windows

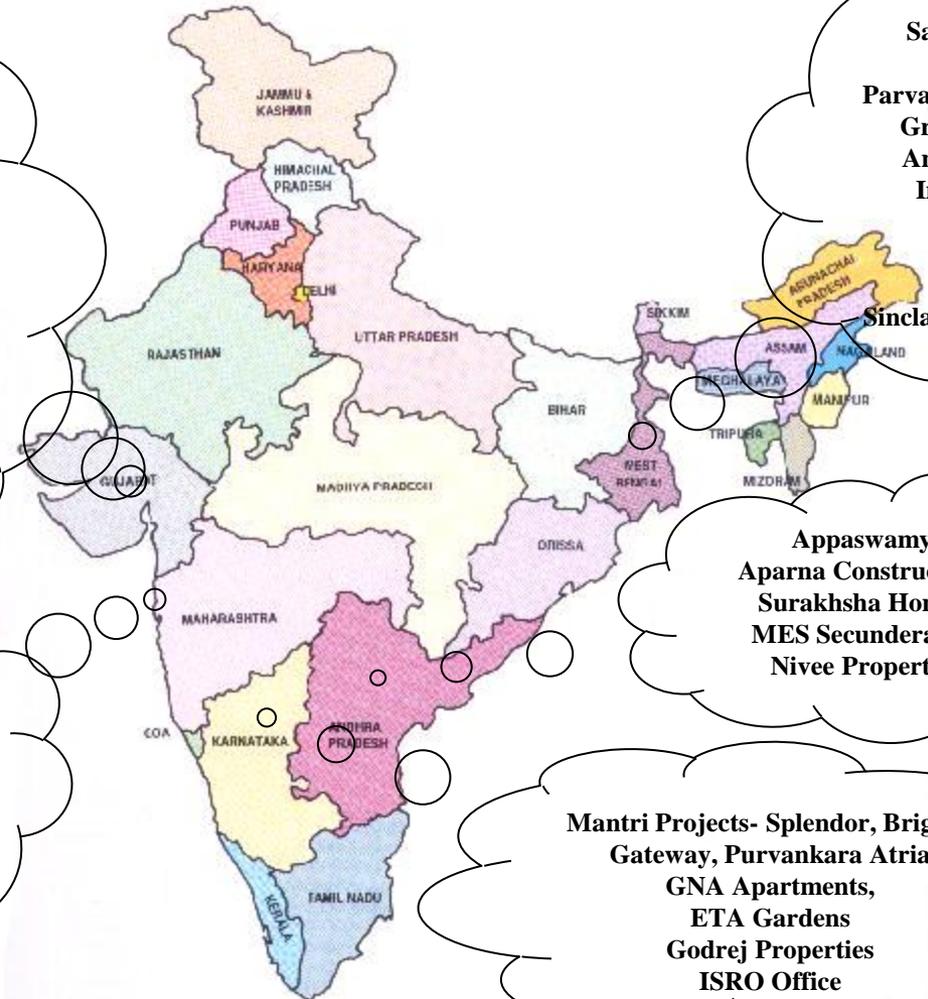
Arvind Mills, A'bad
NRI Park Bungalows, Rajkot
Rishikesh Builders, Surat
Dhirubhai Ambani School,
Welspun Factory, Bharuch
Cama Hotel, A'bad
Hotel Radisson, A'bad
Agri University, Junagarh

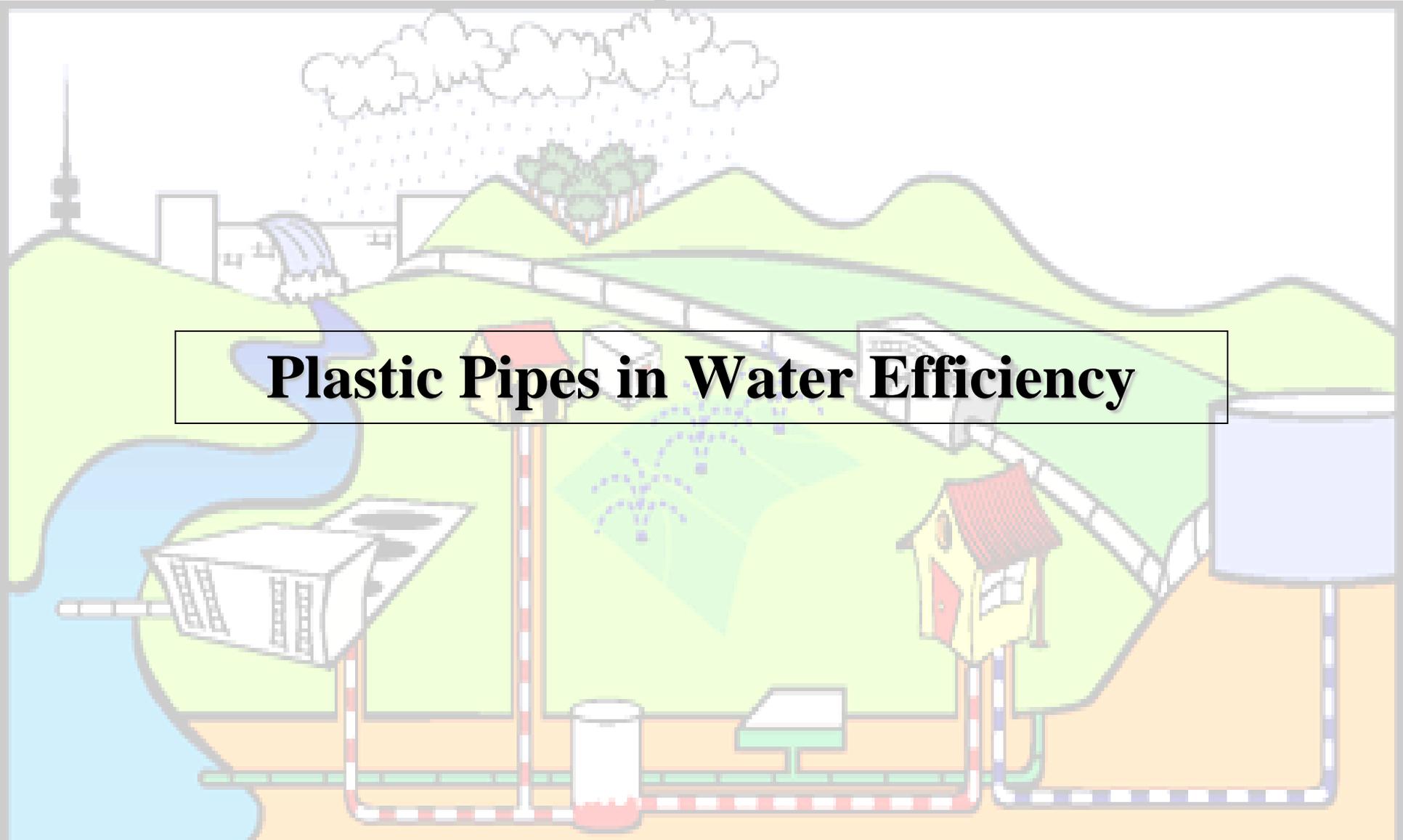
Salarpuria Properties office,
Kankaria Residential,
Parvati Residential, Bengal
Greenfield Office, Bengal
Ambuja Office, Star
Infrastructure Residential,
American Consulate,
Wockhart Hospital
Taj Ginger
Sinclair hotel WB
Govt.VVIP Guest house

Appaswamy,
Aparna Constructions
Surakhsha Homes,
MES Secunderabad
Nivee Properties

Hotel Taj President, Colaba
Unity Projects Worli
Kesar Exotica, Navi
Mumbai
Godrej Edenwoods, Thane
Lilavati Hospital, Bandra

Mantri Projects- Splendor, Brigade
Gateway, Purvankara Atria
GNA Apartments,
ETA Gardens
Godrej Properties
ISRO Office





Plastic Pipes in Water Efficiency

Plastic Pipes in Building & Construction

Water supply

Plumbing Pipes

Sewage Transmission

Soil, waste discharge system

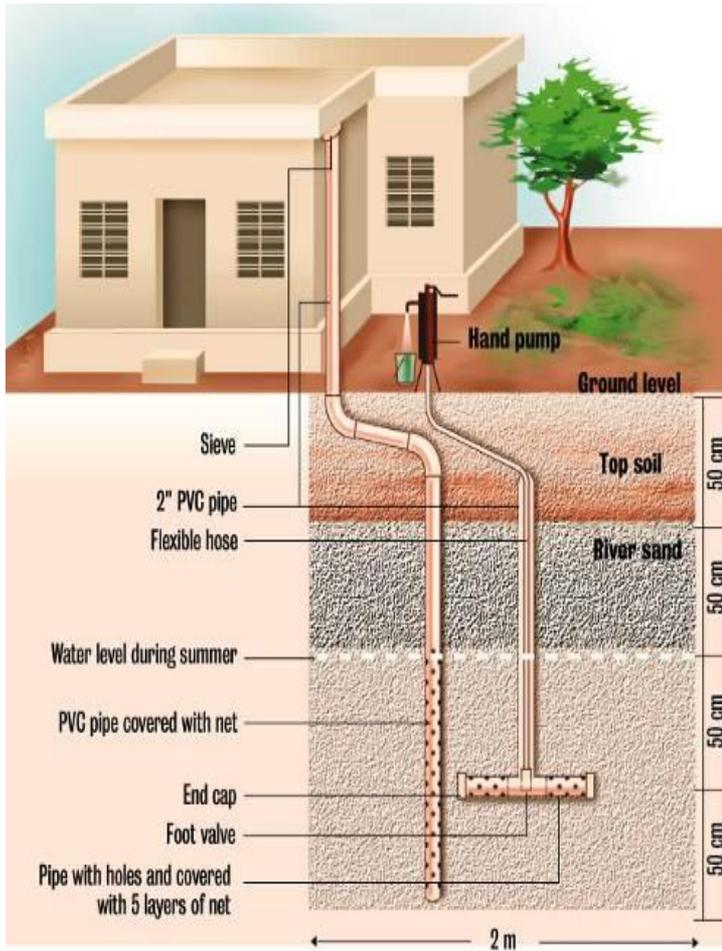
Rain Water Harvesting

Borewell casings

Column pipes



Rain Water Harvesting



- Components – Half round gutter, SWR, Casing & Column pipes

- Advantages of PVC pipes in RWH

- No contamination of water

- Easy discharge due to smooth inner surface

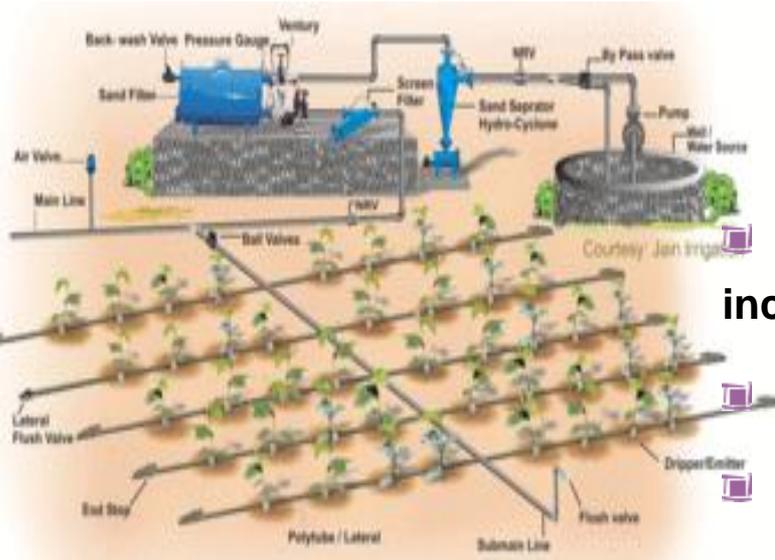
- No fungal growth or biofilm formation

- No maintenance

- Easy installations



Plastic Pipes for Micro Irrigation System



PVC Pipe, Polyethylene tubes and Pipe Fittings play very important role in micro irrigation system

Advantages of PVC & PE pipes in drip systems include :

Low pumping energy required

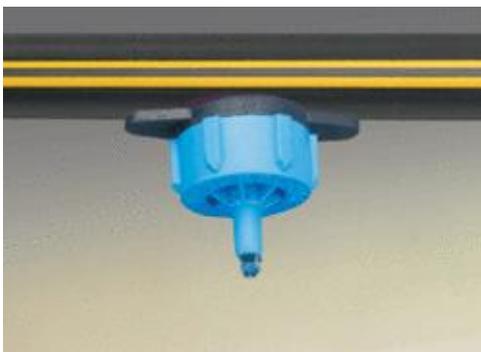
Efficient water distribution due to water tight joints

Easy to install and maintain

Low operating costs

Recyclable

Resistant to chemicals, suit for addition of fertilizers



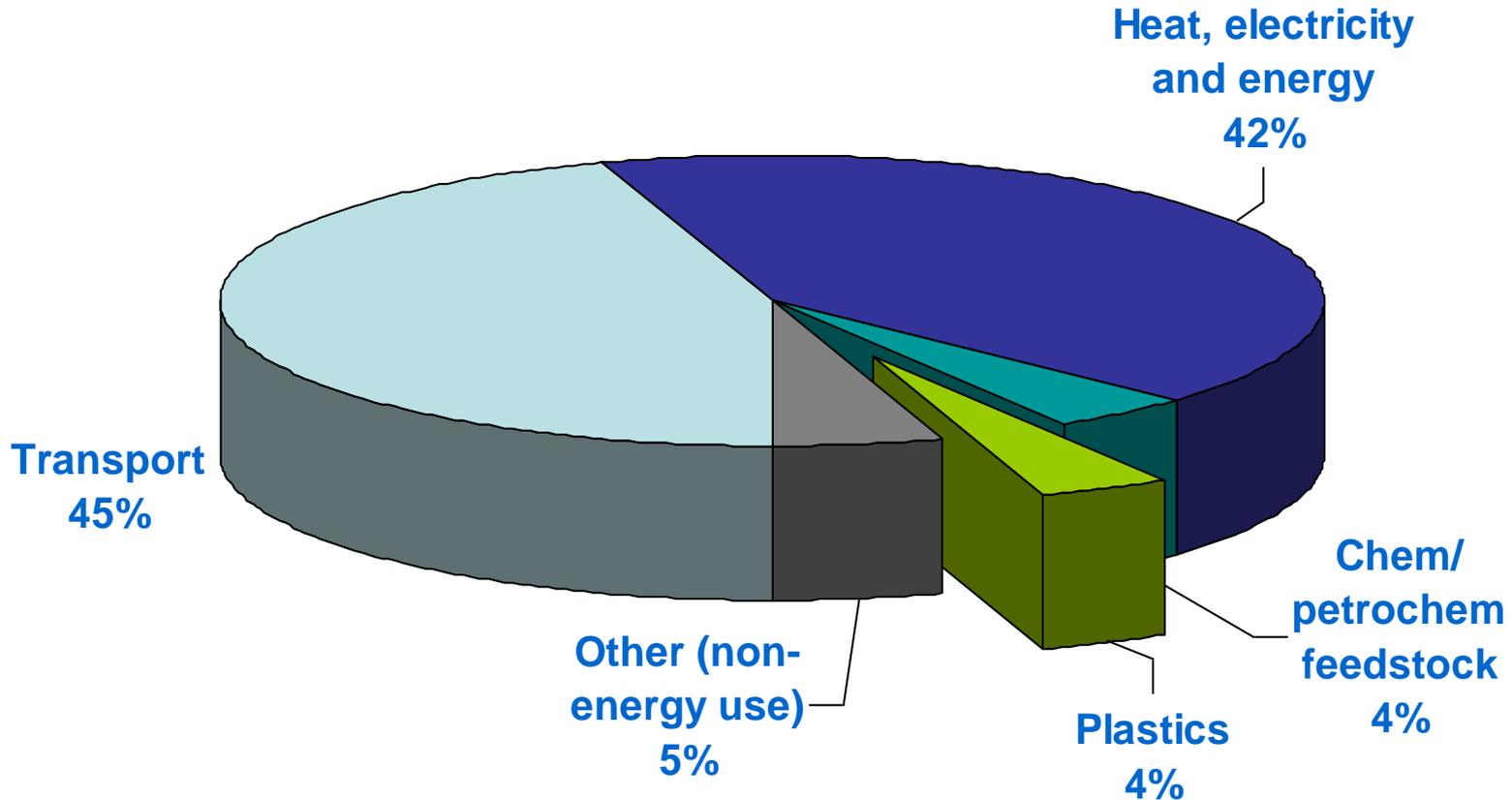
Plastic pipes plays important role in Building and Construction by

- ❑ **Protecting occupant health by delivering safe water**
- ❑ **Contributing to energy saving as require low pumping energy**
- ❑ **Helping to maintain ecological balance by less consumption of natural resources and low emission of toxic gases**
- ❑ **Contribute to reduction in waste generation, being recyclable**
- ❑ **Excellent long term performance hence almost no maintenance**
- ❑ **Reduce environmental impacts by easy transport of run off water**
- ❑ **Conserve environment by reducing pollution of water resources.**



Plastics for Resource Conservation

Consumption of Oil



Plastics put the least pressure on natural resources

- **Over 16% world population**
- **Over 15% livestock population**
- **~ 2% of geographical area**
 - **< 1% of the forest area**

.....and the forest cover is
depleting year by year

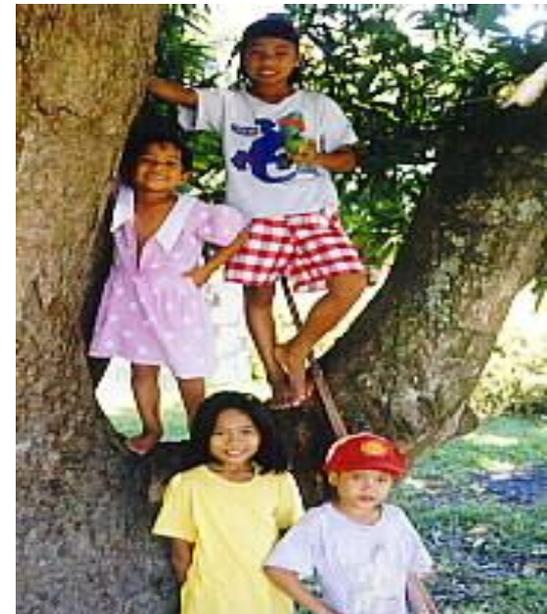
Plastics – Conservation of Forest Resource

5 lakh PVC bath room Doors

consume 6,000 MT of **Plastics**

saves 140,000 Cu M. of **Wood**

32,000 Hectares of **Forests !!!**

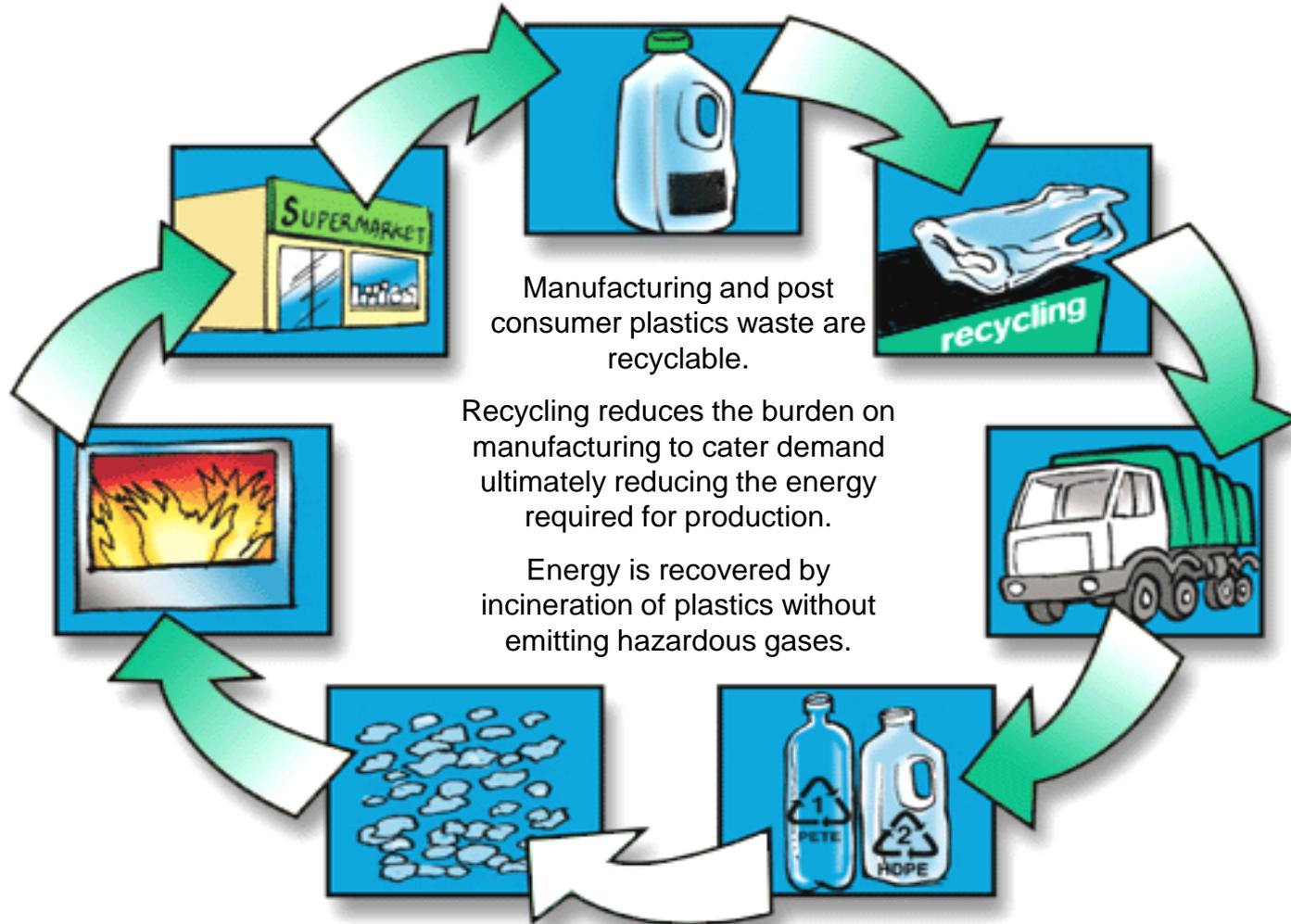




Waste Management

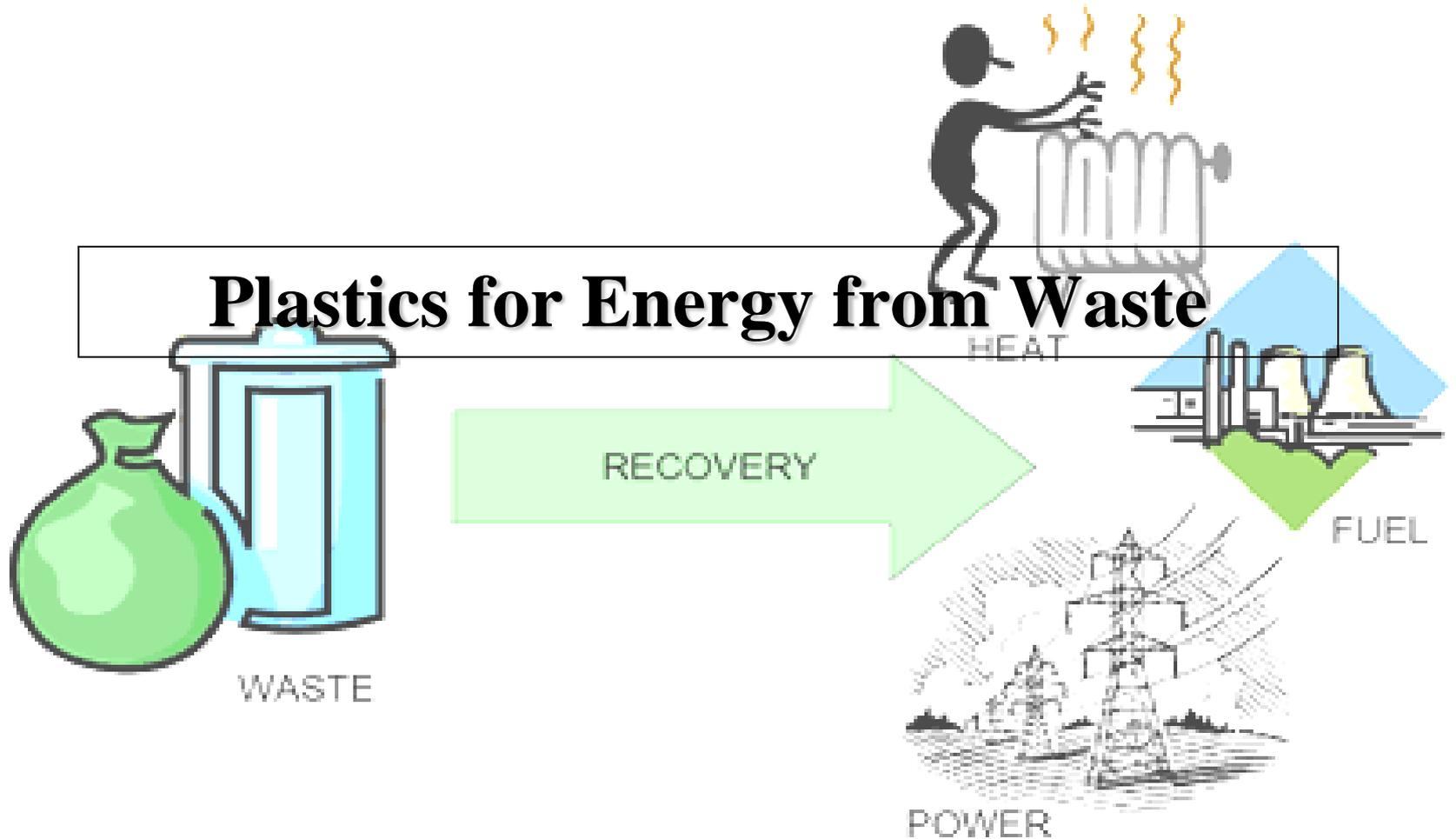
- **Green architecture seeks to reduce waste of energy, water and materials**
 - Reduce the amount of material going to landfills.
 - Providing compost bins
 - Use of Greywater for subsurface irrigation or to flush toilets and wash cars (if treated).
 - Rain water collection system
 - Conversion of waste and waste water into fertilizers

Recycling

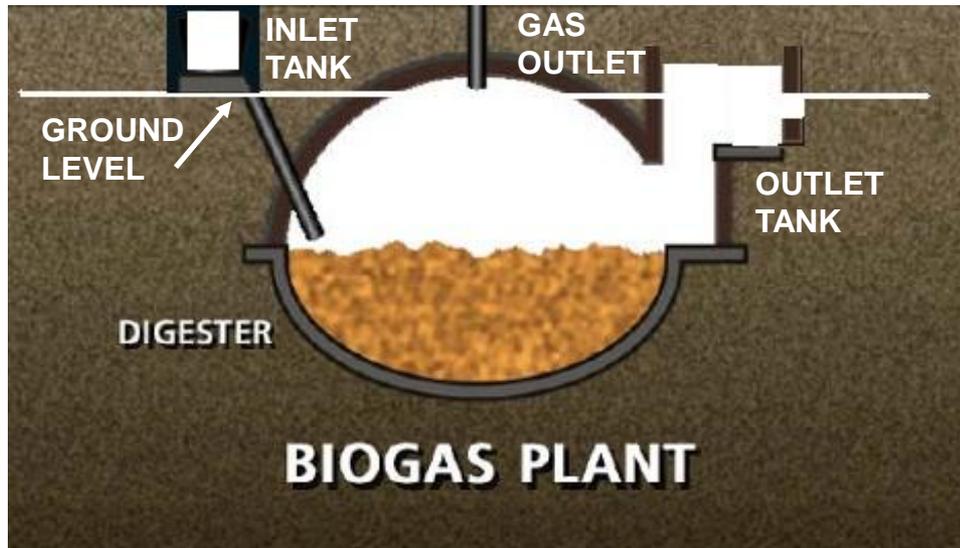


Reusability & Recyclability of plastic materials making them a green materials.

Plastics for Energy from Waste



Polyethylene Biogas Dome



Replacement of brick work dome by Polyethylene dome – savings in time & energy for installation

Plastics – contribution in energy conservation at every stage

Plants With PE Domes : Features

- ❑ **Gas Tightness**
- ❑ **Easy to handle, transport and install as light in weight.**
- ❑ **No effect of gas and chemicals in the system as well as stabilized against UV radiations**
- ❑ **Construction time reduced to 6 days as against minimum of 21 days for conventional plants**
- ❑ **Dome curing totally eliminated**
- ❑ **No specialized skills needed for Dome installation**
- ❑ **Transfer of Technology of Implementation to grass root level organizations is easy**
- ❑ **Most suited to renovate the existing plants defunct due to dome leakage/cracks**

Approved by MNRE

Plastic waste to fuel

- ❑ Plastic products on the completion of life cycle can be put to the different processes of waste management.
- ❑ One of such solution is **Fuel from Plastic Waste**.
 - ❑ Plastic Waste is converted to diesel equivalent fuel by pyrolysis in presence of catalyst.
 - ❑ Cost effective technology for the process is indigenously developed
 - ❑ The fuel can be used as fuel for generators, agricultural pumps or for industrial heating applications. This fuel is much cost effective compared to diesel.
 - ❑ Fuel generated is approved by various National & International Agencies as well as Pollution Control Boards.



Plastic Waste - Resourceful Material

The Bottom line



Life Cycle Cost Consideration – Need of the Hour

Plastics Conserve E2



= **Green**



**But, it's only the
beginning !**

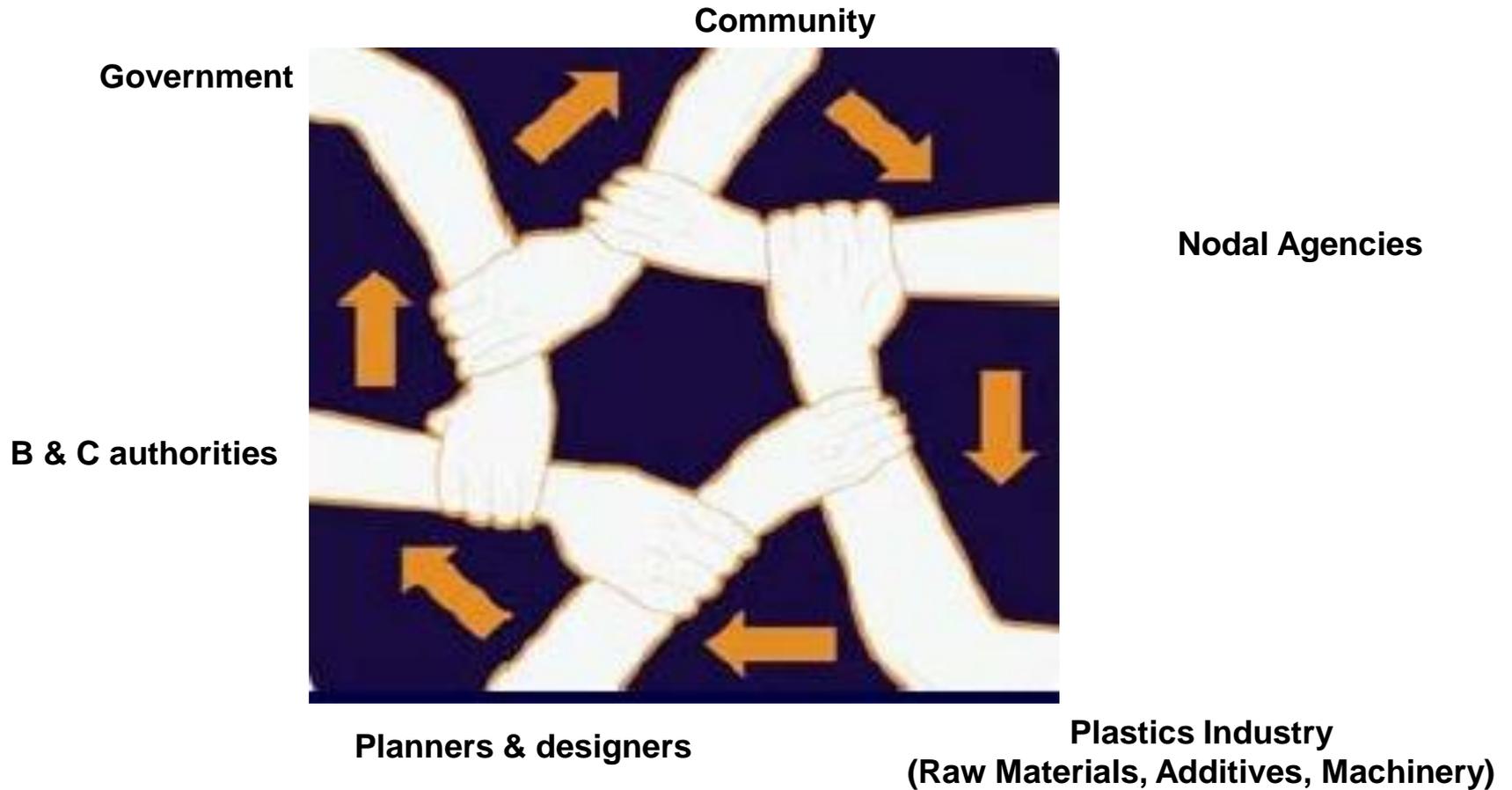
It is a Great Start



Green



Joining Hands : Way to Future



Think out of the box...



***For most people the horizon is as far as they can see
for some it represents the threshold to an unseen world of
New Opportunities***



Thank You