Biogas Technology A sustainable waste management tool.

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Presentation Cover

- **Background**
- **Introduction of Biogas and its uses**
- **Biogas plant construction process**
- **Government support and present status**
- **Achievements**
- **Our experience on waste management**
- **Challenges and opportunities**
- **Conclusion**

Background

- **Nepal is considered one of the lowest in energy consumption.**
- **Major share of energy consumption based on traditional energy sources.**
- **Despite the high potentiality of hydropower due to lack of financial, technical and various geographic as well as physical condition of the country, it is still a challenge.**

- **Looking at the nation's energy demand and people's buying capacity, biogas technology is one of the reliable alternative energy sources for Nepal**
- **Biogas technology is more popular in household use for cooking and lighting purpose.**
- **Biogas technology has proved to be very successful since it not only produces gas as source of energy but also provides good fertilizer in the form of digested slurry.**

- Acceptance of the technology depend upon family decision as well as community decision
- Kitchen waste, animal waste and human excreta are used as feeding materials in biogas plant.
- The success or failure of a biogas plant depends upon its quality of construction and materials used.
- Fixed dome model – GGC 2047 is popular in Nepal.

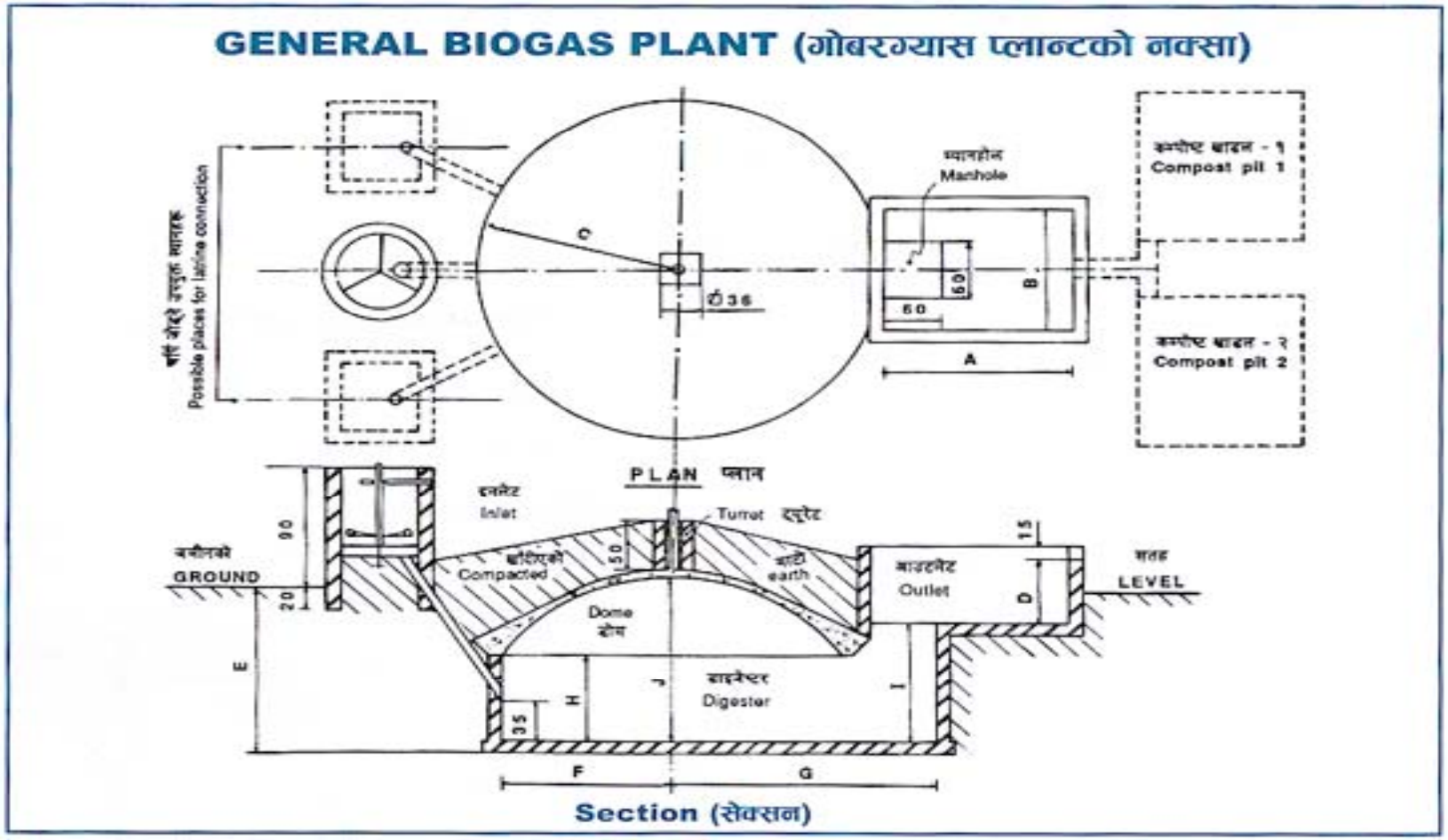
What is Biogas?

- **Biogas is the mixture of gas produced by methanogenic bacteria while acting upon biodegradable materials in an anaerobic condition.**
- **Biogas is mainly composed of**
  - **40 – 70 percent methane (CH4),**
  - **30- 60 percent carbon dioxide (CO2) and**
  - **5 percent of low amount of other gases including**
    - **hydrogen (H2) 0 – 1 percent,**
    - **hydrogen sulfide 0-3 percent.**
- **It is colorless and burns with a clean blue flame similar to LPG with smoke free.**

In principal, a biogas plant has four major components as follows:

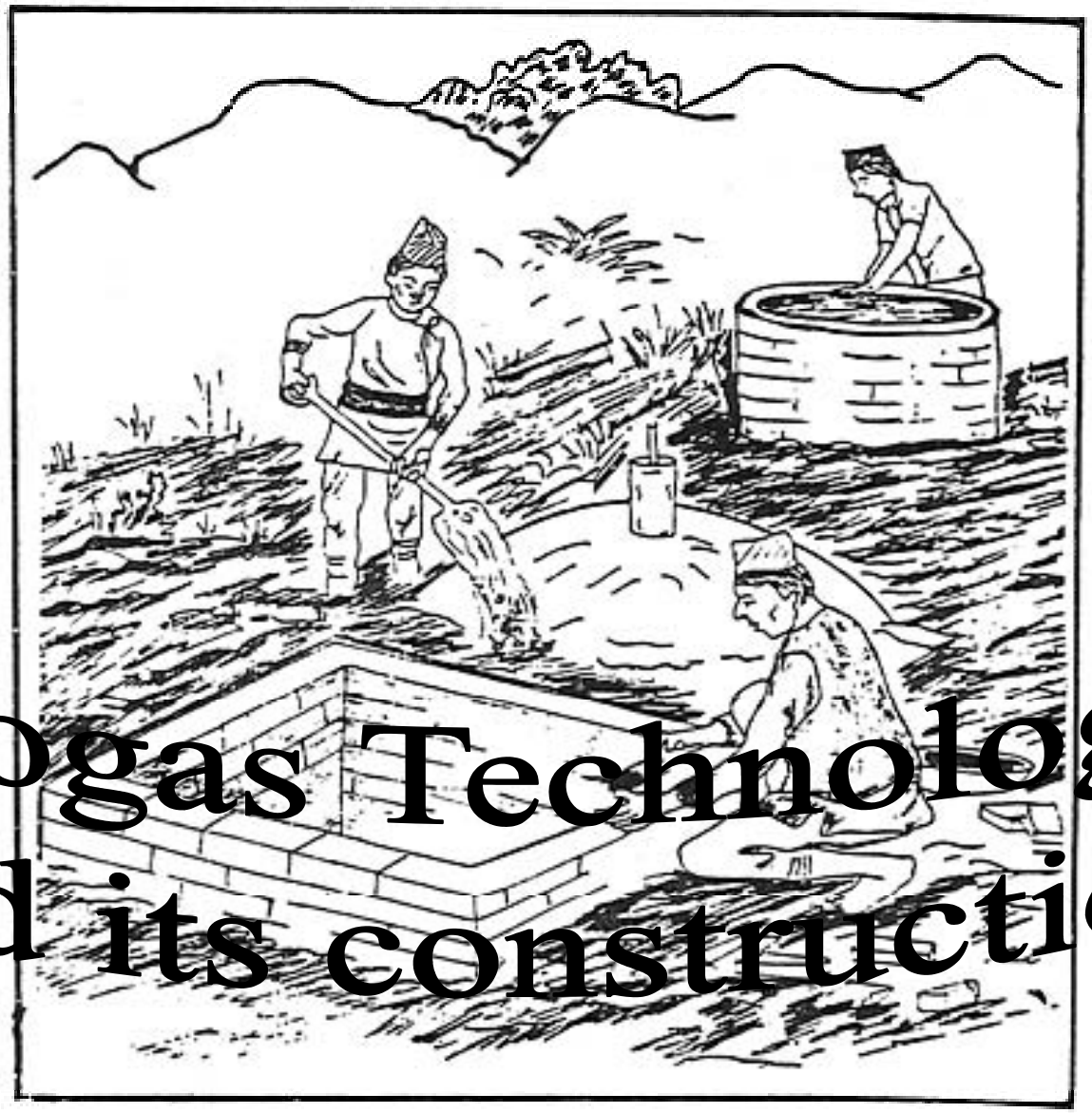
- **Inlet:** a structure is required to feed the organic matter,
- **Digestion Chamber**: anaerobic reaction or digestion of organic matter by methanogenic bacteria takes place;
- **Dome:** gas storage take place; and
- **Outlet:** a structure is required to overflow the effluents.

Diagram of fixed dome biogas plant



Construction Materials Required

- Stone or bricks
- Sand
- Gravel
- Cement
- Iron rod
- Mixer
- Inlet Pipe
- Half Inch GI Pipe
- HDPE Pipe
- Dome Gas Pipe
- Main Gas Valve .
- Water trap
- Gas Tap .
- Rubber Hose Pipe .
- Gas Stove
- Lamps as necessary.
- Fitting accessories



Biogas Technology and its construction

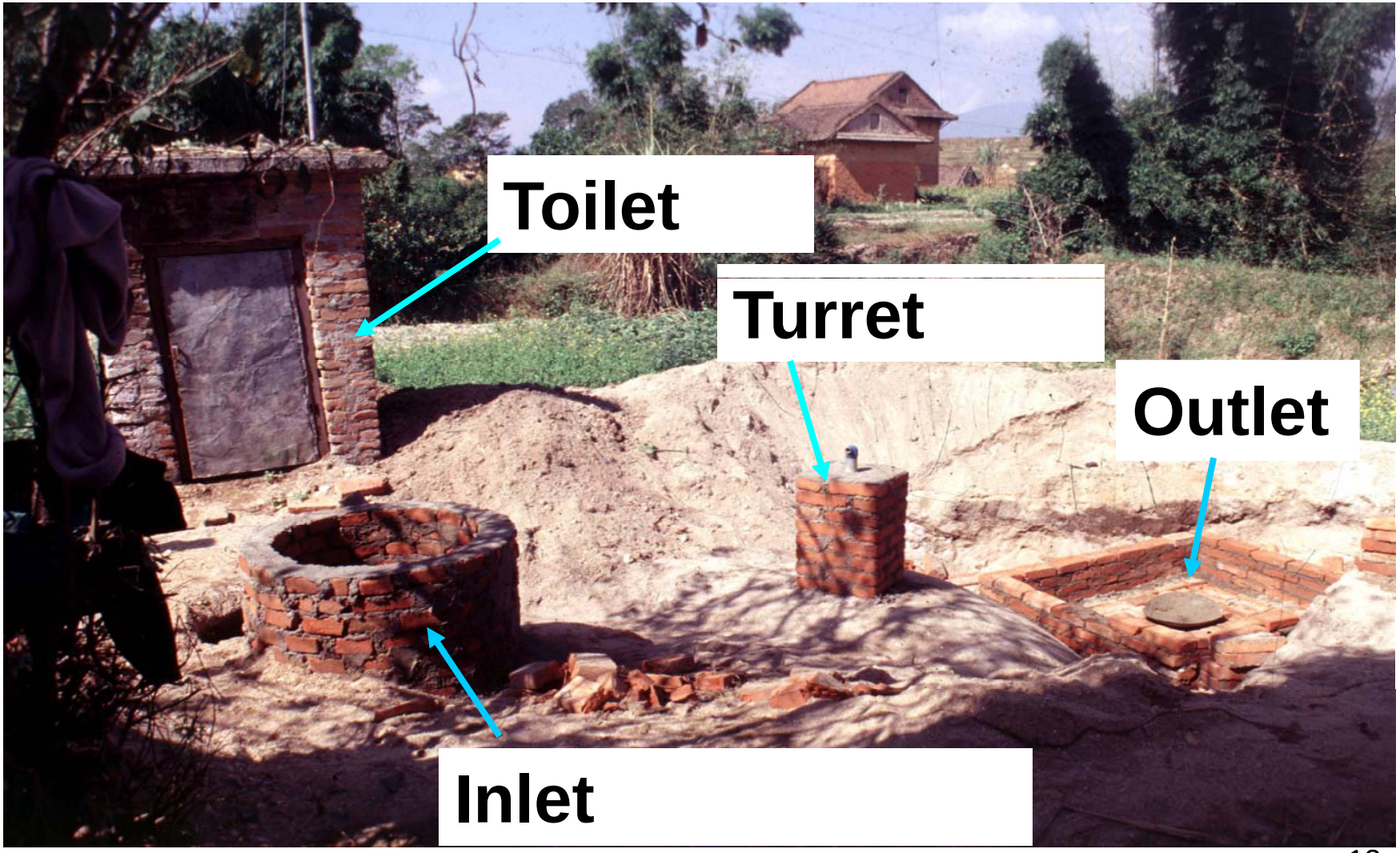
Biogas Plant construction process

- Site selection for the plant should be carried out
- After site selection, layout of inlet, outlet, digester and compost pits should be made as per the drawing.
- The centre of the dome and circle of diameter is marked on the ground.

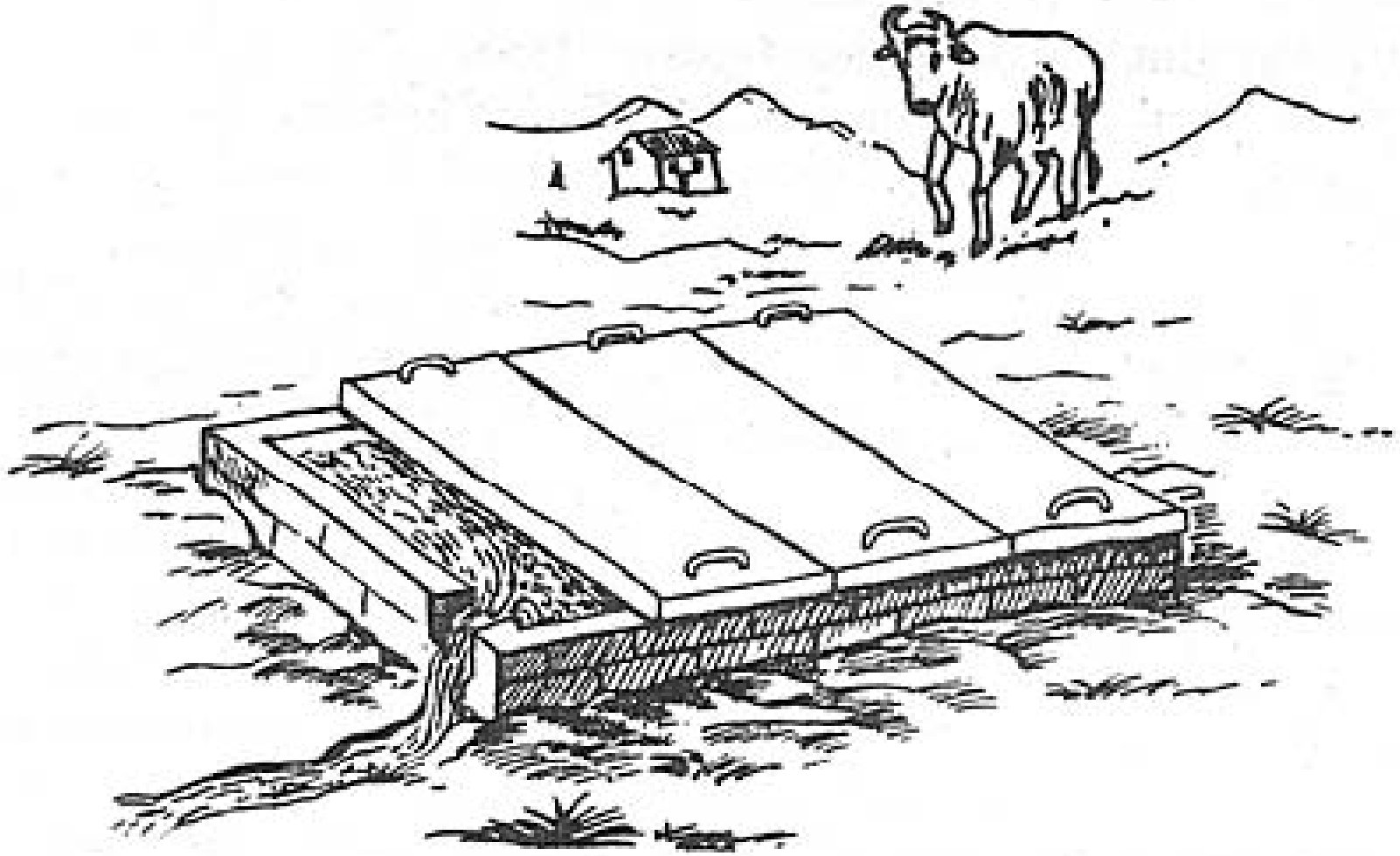
Filling the digester pit by mud

The digester pit is filled with mud up to the height of the dome

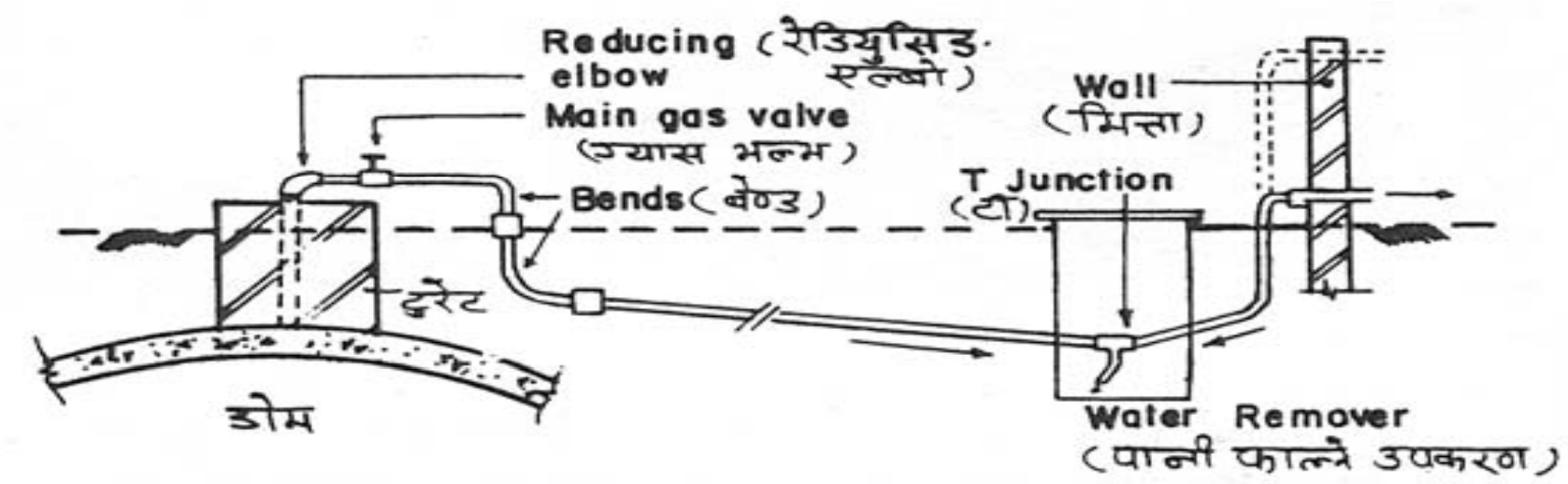
Inlet, outlet, turret and toilet



Outlet Slab

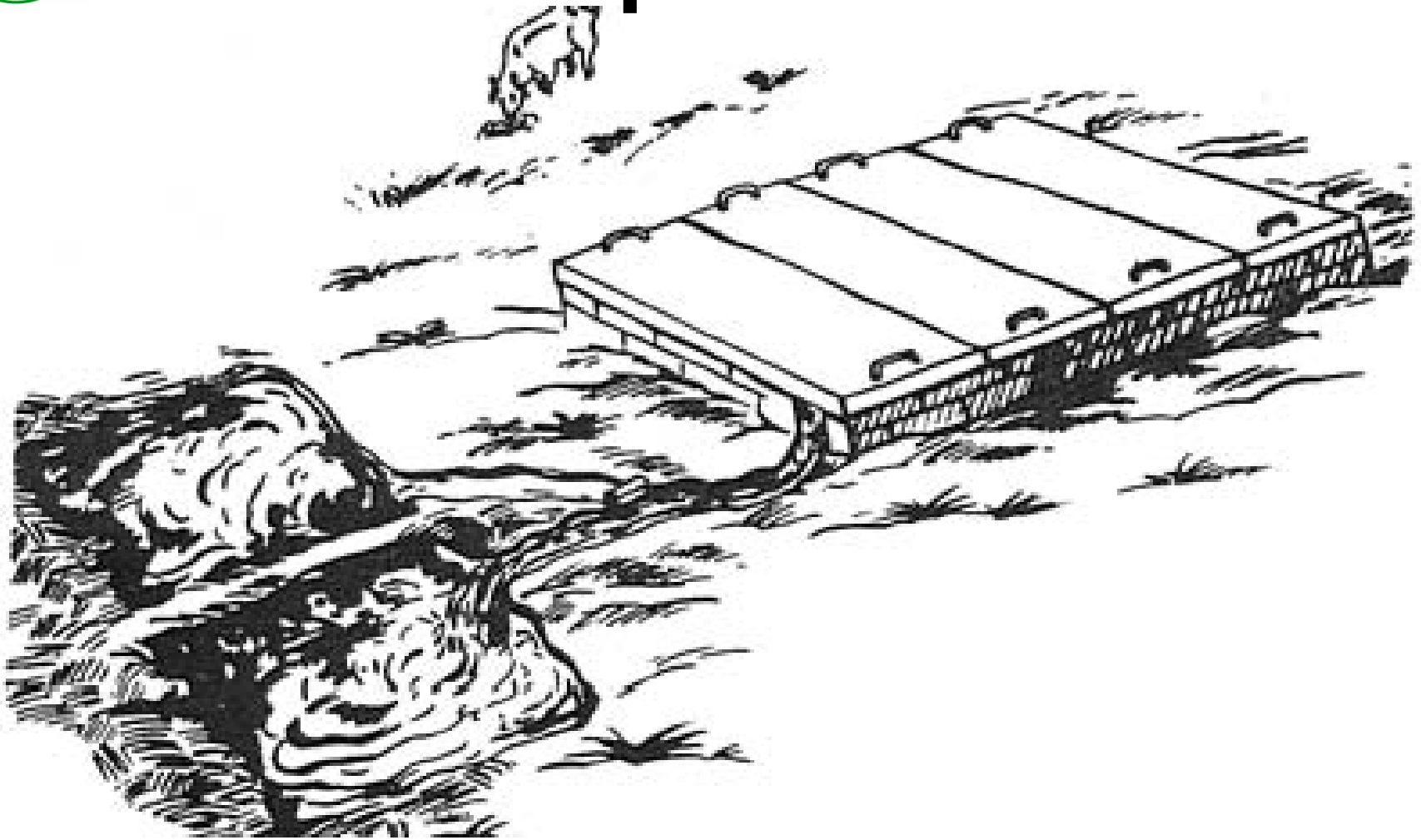


Water drain



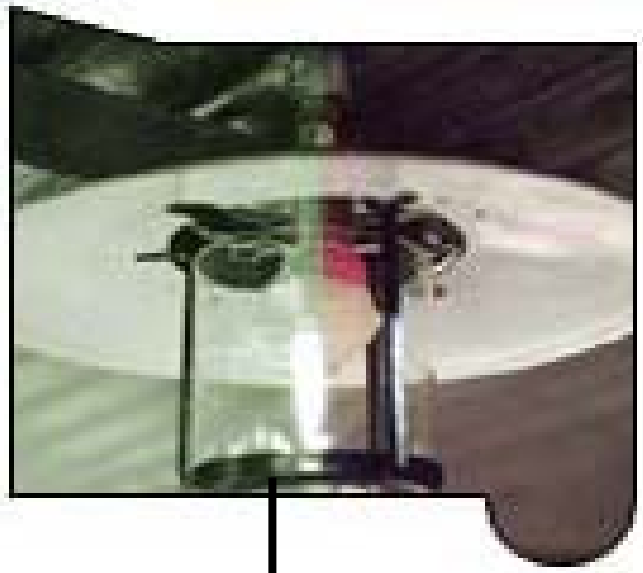
Water drain must be made at the lowest level of the fittings.

Compost Pits



Mixture

Biogas Stove



Biogas Lamp

Present status of biogas progrmme in Nepal

- From July 2003- June 2009 : 4th phase of biogas programme has been started.
- Biogas Sector Partnership Nepal (BSP-Nepal) is introduced for further develops and disseminates biogas as a mainstream renewable energy technology in rural areas of Nepal.
- Target 200000 biogas plants.
- 72 biogas companies working in 65 districts with more than 180 branches
- 16 appliances manufacturers
- ADB/N, RBB, NBL and 173 micro finance companies are providing loan

- **The Netherlands Directorate General for International Cooperation (DGIS, SNV/N), the Germany Government through KFW and Nepal government is supporting the programme with financial assistance to the subsidy and credit component.**
  - **KfW contribution 70% of subsidy component.**
  - **DGIS contribution 8% of subsidy component.**
  - **Nepal Government contribution 22% of subsidy component**

Government Subsidy policy

- Subsidy
- NRs 9000 per plant – Terai (20 districts)
- NRs. 12000 per plant– Hills (40 districts)
- NRs. 16000 per plant –Remote Hills (15 districts)
- Additional Rs 700 for 2, 4 and 6 cum biogas plant
- Additional Rs 700 for low penetration districts – (18 districts)
- Additional Rs 2000, Rs 2500 and 3500 for Propoor, Dalit, Janjati, Dondapidit, Utpidit in Terai (20 districts), Hills (40 districts) and R hills (15 districts)

Institutional Subsidy

- **Institutional plant subsidy**

  Rs 8000 per plant for Terai (20 districts)

  Rs 12000 per plant for Hills (40 districts)

  Rs 16000 per plant for R Hills (15 districts)
- **Community plant subsidy**

  Rs 6000 per HH for Terai (20 districts)

  Rs 9000 per HH for Hills (40 districts)

  Rs 12000 per HH for R Hills (15 districts)

Transportation subsidy

- Rs 2000 per HH per plant in Bhojpur, Darchula, Jajarkot, Khotang, Sankhuwasabha, Bajhang, Bajura, Jumla, Kalikot, Manag, Mustang, Solukhumbu.
- Rs 4000 per HH per plant in Dolpa, Humla and Mugu

Achievement

- Installed 208633 biogas plants under BSP/N program.
- 72 private biogas companies have been strengthened
- 16 biogas appliances manufacturing workshops are developed
- Comprehensive quality standards and quality control system is developed
- 96% of constructed plants are in operation
- 65% toilets are connected with biogas plants.

- 74% of bioslurry is utilized as an organic compost fertilizer
- Biogas programme is developed as a first CDM project in Nepal
- BSP-Nepal is an ISO 9001 – 2000 certification holder for its strong quality management system and subsidy administration
- 173 micro finance institute are mobilized on biogas lending
- 11,000 persons got employment

Annual saving from biogas plants

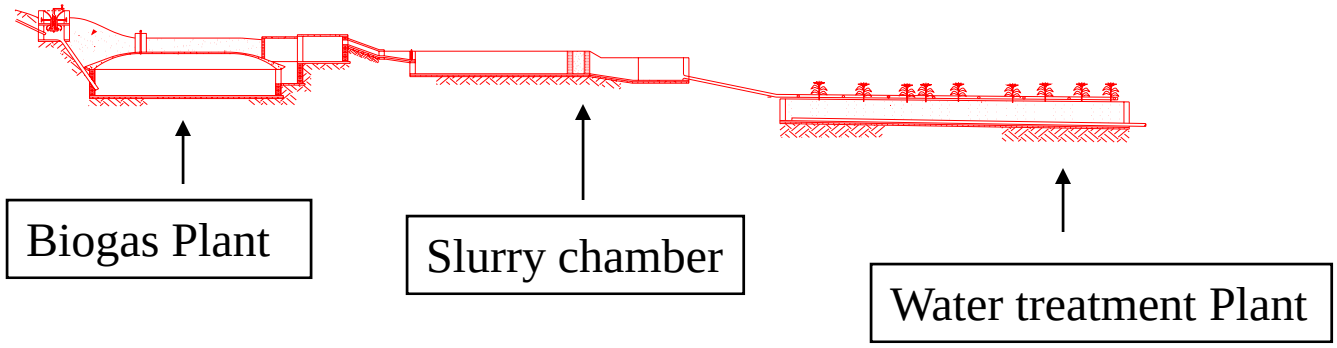
- Saving of 0.4 million tons of fuel wood consumption per year
- Production of 0.2 million tons of compost fertilizer per year
- Saving of 0.8 million liters of kerosene per year
- Reduction of 0.6 million ton of CO2 emission per year
- Saving of 3 hours per plant in a day

First CDM Project

- Register as first CDM project of Nepal
- 19396 number of biogas plants are register in CDM project under Kyoto Protocal
- A biogas plant reduces 4.99 ton of GHG annually
- Agreement has been signed with world bank and AEPC for 7 years
- Rate US$ 7 per ton
- Yearly income 4,34,00000/-

Our experience on household waste management

Biogas Plant Integrated With Waste Water Treatment Plant

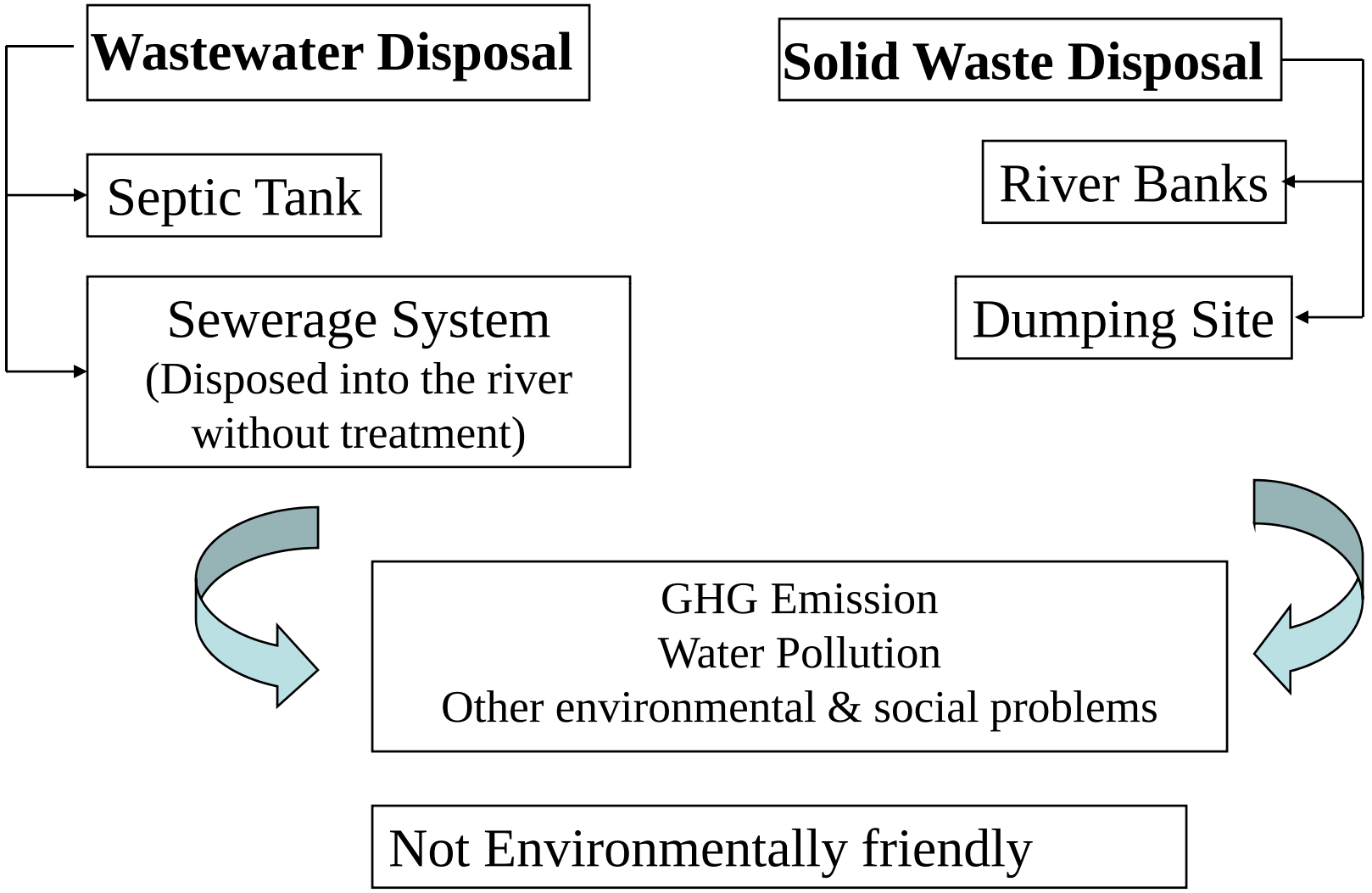


Problems of Kathmandu Valley

- Rapid & haphazard urbanization
- Very high population growth
- Poor waste management system

- Untreated wastewater disposal
- Sever environmental & social problems

Waste Management



Pollution status

- No Study has been found regarding the GHG emission from septic tank.

- The studies regarding water pollution showing;
  - The water in the river systems after core city areas is no more applicable for any use; and
  - Ground water is also extremely polluted

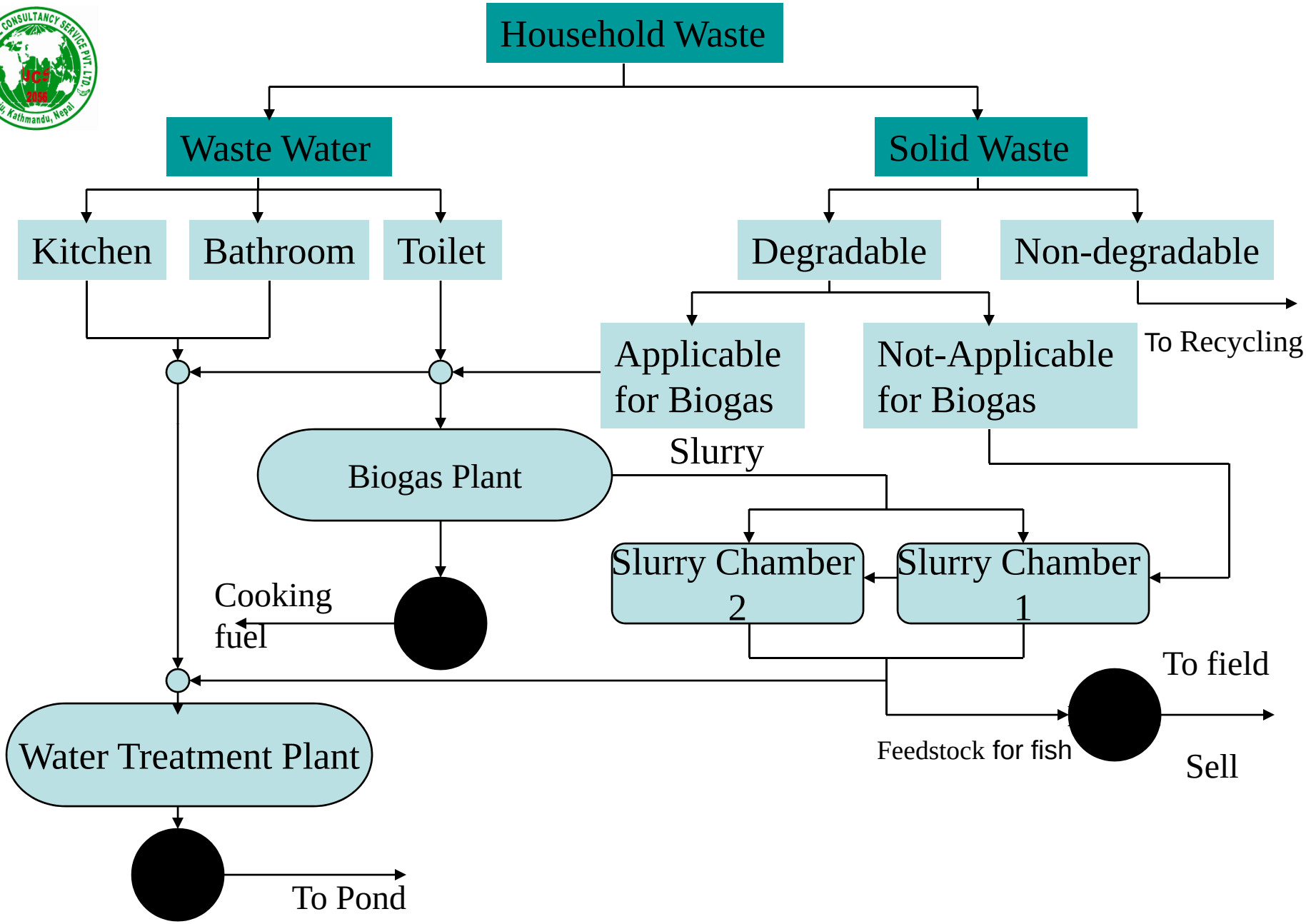
Problem

The pollution condition of Kathmandu valley will be further aggravated if no effective measure is applied.

Objectives of the Project

- To utilize waste & get energy
- To manage household waste in environmental friendly and sustainable manner

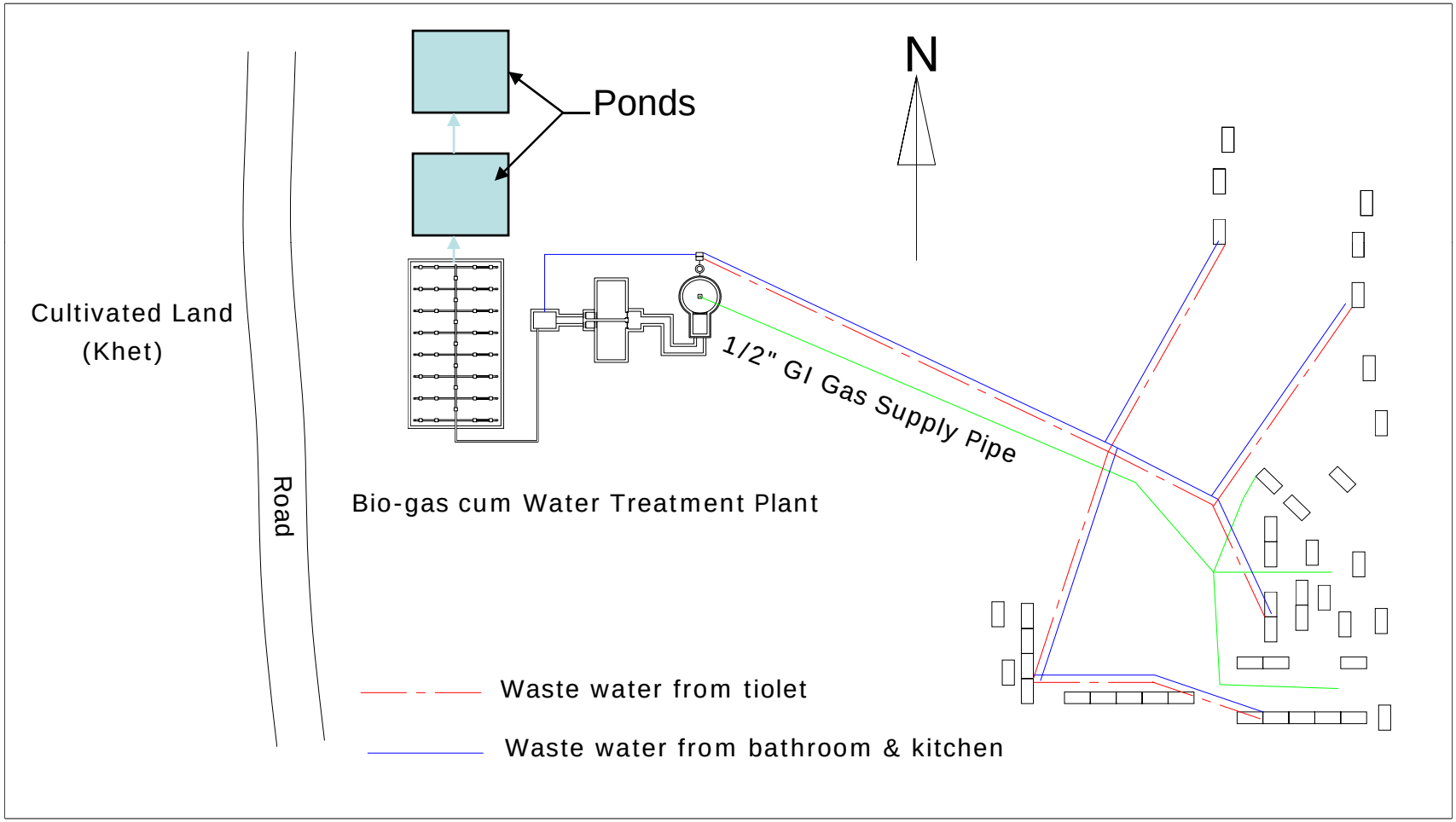
The Approach


Household Waste
Waste Water
Solid Waste
Kitchen
Bathroom
Toilet
Degradable
Non-degradable
To Recycling
Applicable for Biogas
Not-Applicable for Biogas
Slurry
Biogas Plant
Slurry Chamber 2
Slurry Chamber 1
Cooking fuel
To field
Feedstock for fish
Sell
Water Treatment Plant
To Pond

Description of Project

- **No. of households:**
  - **40 HHs at present & ~ 50 in future**
- **Population : 230 - 300 Nos.**
- **Project initiated by:**
  LUMANTI - Support Group for Shelter, a local NGO
- **Financial support: Water Aid/UN-Habitat**
- **Technical support:**
  Motherland Energy Group Pvt. Ltd.
- **Ownership+ Contribution:**
  Local community

Project Description



Salient Features of the Project

- Biogas Plant : 20 cum
- Slurry Chamber: 30 Cum (each)
- Water Treatment Plant:

  ~ 15 Cum/day

  (~200 Sq. m. Surface area)

- Total Project Cost: NRs. 10,00,000

1 $ = NRs. 63

Uses of Byproduct

- Biogas –

  Supply to 5 Households

- Slurry –

  Use as a manure

- Treated water-

  Use for fishery (to Pond ultimately to irrigation)

Lively Explanation of Constructional Features

Site made ready for grey Water settlement chamber & Slurry Chamber

Site made ready for Water Treatment Plant

Sustainable Operation Issue!!!!!!!

Waste Screening

Waste Applicable for Biogas

Waste Applicable for Slurry/ Composting Chamber

Non-Degradable Waste

Provided Such set of Buckets for all

Challenges

- It has been tried to adopt at the grass root level people
- It has been applied in the community level instead of individual household
- People are used to for using detergent to clean the toilet
- Community people are not used to for screening the different type of waste produced in the household
- Community use Grey water into the irrigation before treatment

Observation

- The plant is running very well
- Five Family are using biogas for cooking (2-3 hours per day).
- Other HHs are also interested to connect biogas
- The Slurry is being used as a manure.
- The environment of the community is very clean
- People manage the operation of the plant very well

Observation (Contd…)

- It becomes the demonstration site for students and researchers
- The management committee set the rate for external observers
  - Rs. 500/group up to 5 people in a group
  - Rs. 1000/group for>5 people in a group
  - Accordingly, They collect Rs. 6000 till now
- The community people are very happy with the plant

Conclusion

- The project is in successful Operation.
- The Community feel the full ownership and manage the plant effectively

Where to Apply

It seems possible to apply this approach at:

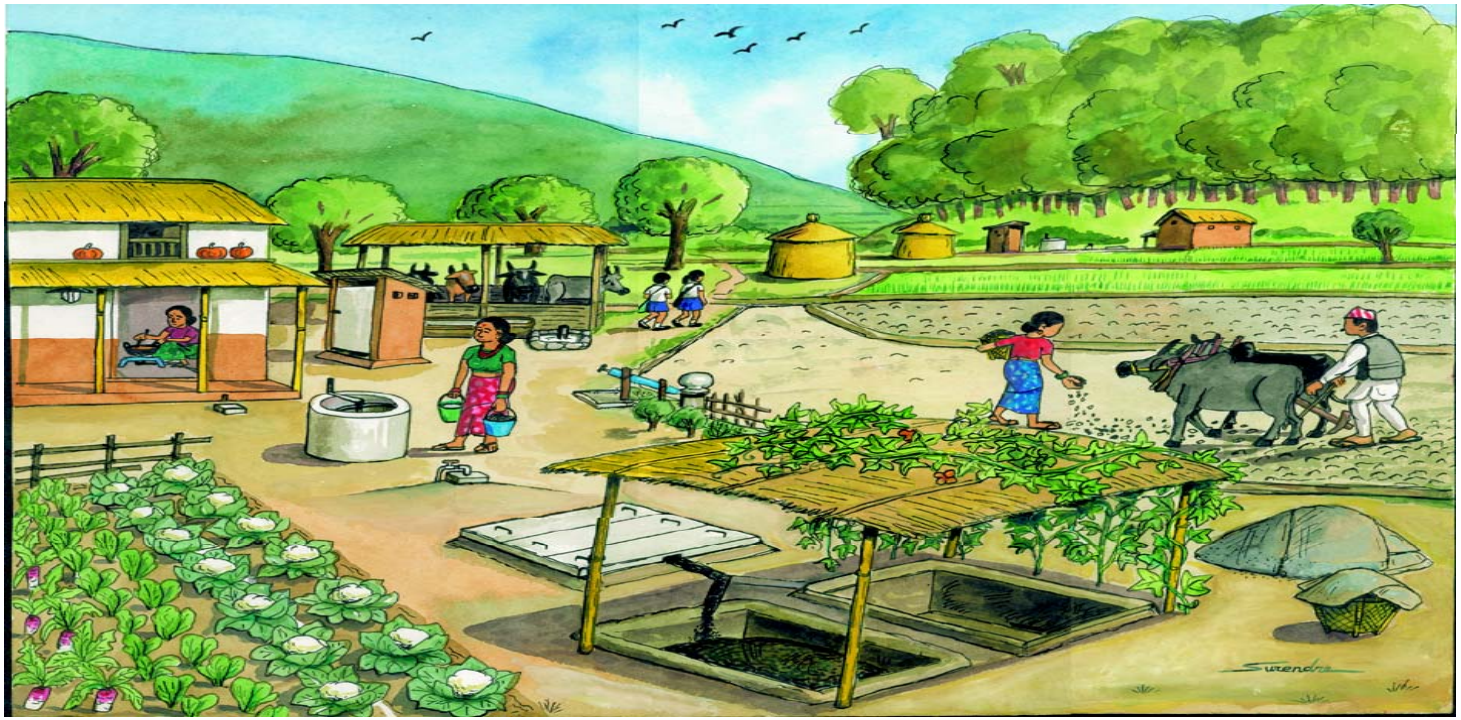
- Schools, hotels, restaurant, barrack, hospitals & similar institutions
- New settlements

Possible Benefits

- Drastic reduction of solid waste produce from the households (~ 80 to 84 % of HH waste production)
- Reduce the GHG emission (by substituting the septic tanks)
- Reduce river pollution (by producing almost pollution free water which can also be reused)

As a by product;

- Use biogas as a supplement for the imported cooking fuel like LPG, kerosene etc.
- Use the slurry as a good organic manure



THANK YOU