DEVELOPMENT OF GREEN BELT FOR HEAVY WATER PLANT (MANUGURU)

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INTRODUCTION:

After attaining independence India embarked on ambitious projects related to production of energy, agriculture, housing and industrial development. These programmes were aimed at attaining objectives such as Social Welfare and economic development. But the ecological considerations did not get the importance they deserved during planning. Now there is an urgent need of a policy on conservation of ecology while planning projects.

The global awareness started as early as 1972 when "U.N. Conference on Human Environment" was called at Stockholm. But nothing substantial happened on this front till 1987 when U.N. World Commission on Environment & Development Published the report "Our Common Future". By this time Governments & Planners had become "Environmental Conscious" to certain degree. But certain damages such as global warming, acid rains, Ozone layer depletion etc had already taken place. But the conservationists lacked the muscle power to enforce their views.

The importance of conservation has been felt all over the world and rightly "United Nations Conference on Environment and Development" (UNCED) popularly known as "Earth Summit" has been called at Rio-De-Janeiro from June-1 to 12.1992

The 'Earth Summit' is likely to conclude " An Earth Charter" which will be a blue print for action in all major areas of relationship of man with environment focussing a period well into 21st Century.

Seen in the light of above the efforts made for providing 'Green Belt" at HWP Manuguru gain lot of importance.

IMPACT OF ECO SYSTEM:

The Main Plant consists of 2 (Two) streams of exchange towers for H2S-H2O exchange and distillation tower for enrichment of dilute heavy water. H2S is generated by reaction between sulphuric acid and sodium sulphide.

The captive power plant is coal based, designed to burn about 3000 Tonnes of coal daily.

ECOLOGY PRIOR TO SETTING UP OF PLANT:

The land acquired for plant was partly agricultural, grass land and forest land. River Godavari flows adjacent to the area.

Brief general discussion on related biogeochemical cycles is of relevance here. Important cycles likely to be affected are:

1.Carbon Cycle 2. Oxygen cycle & 3. Sulphur cycle. All these cycles are very essential for survival of life on earth.

Carbon cycle:

(Ref Annexure-A) Carbon is basic component of all living matter. It is essentially a perfect cycle in the sense that carbon is returned to atmosphere about as fast as it is removed. Movement of carbon is from gaseous phase to producers, consumers and from both these groups to de-composers and then back to atmosphere. The producers are mainly trees which fix CO2

by photosynthesis. About 4 to 9 x 10 Kg of carbon is fixed anually by trees and green micro-organisms and a small amount by marine invertebrates. Imbalance in this perfect cycle is caused over last century due to industrial activity, fast burning of fossil fuels, etc. Deforestation is further aggravating the situation. CO2 in the air is projected to reach a value of 380 ppm by 2000 AD from 290 ppm in 1860 AD. CO2 has the property of retaining heat from Sun. Generally from in-coming radiation from Sun 34% is either reflected or scattered in space. Added to this 18% of earth's radiation and 48% radiated back to space, the in-coming and outgoing radiations balance. But increase in CO2 tends to retain heat resulting in global warming through Green house effect eventually leading to melting of polar ice, submergence of coastal areas etc. Increase in CO2 means corresponding reduction of Oxygen in air.

Oxygen Cycle:

Oxygen, whose percentage in air is 21 is essential for respiration. It is produced by photosynthesis of Green plants from Co2.

Sulphur Cycle:

(Ref Annexure-B) This is an excellent example of interaction between biotic and abiotic components of the ecosystem. Sulphates from water are incorporated into proteins by autotrophic plants. During decomposition the proteins release H2S. Part of H2S is converted by micro-organisms to

sulphates and the rest gets fixed in deep sediments under anaerobic conditioins. Oxide of sulphur is a transitory stage in atmosphere which is present in small quantities and gets converted to SO4 through various agents. Increease in SO2 is harmful to biotic components.

IMPACT OF GASEOUS EFFLUENTS:

The Captive Power Plant is expected to burn about 3000 T of coal per day giving following gaseous effluents:-

CO2 - 2400 T per day

SO2 - 23.3 Tonnes per day

The Main Plant involves use of H2S gas in the process but emission of this gas in atmosphere is negligible.

Release of CO2 in the atmosphere:

Quantitatively CO2 is the major gas emitted in the atmosphere by burning of coal. Carbon is essential for life and the maintenance of the balance of the same is important. The ill effects of excess CO2 such as Green house effect have already been discussed. The only effective way by which the CO2 is fixed is natural photosynthesis. While locating the plant units care was taken to leave the original 550 Ha of forest land on the northern side undisturbed. This consisted of tropical forest of mixed vegetation.

Sulphur Dioxide:

Under the normal running of plant some H2S is burnt into SO2 thrcugh flare stack. Burning of coal releases SO2 through the gases.

In the Heavy Water Plant systems measures have been provided such as stacks of adequate height to control emission of SO2 and H2S,electrostatic precipitators to control particulate matter and keep their escape to atmosphere within permissible limits. Yet the scheme for afforestation in the form of Green Belt has been under taken to bring down the values of emissioins to atmosphere in case of accidental release.

A massive programme of tree plantation over an area of 500 ha was launched to form a green belt for a depth of 1 km all round the battery limits of steam generation units and H2S generation and handling units.This campaign was started from financial year 1988-1989.Major contribution for this work was through M/s Andhra Pradesh Forest Development Corporation. Valuable expertise and help was also extended

by Head, L &C.M Section of BARC. Certain objectives were kept in view for developing green belt:-

1. Causing impedance to the dispersion of H2S gas at ground level in case of any emission.

2. Giving forest cover for promotion of bacterial activity under anaerobic conditions for fixing H2S gas through Sulphur cycle.

3. Fixing of carbon through photosynthesis & release of Oxygen.

Preference was given to trees of local origin in view of their capacity to withstand the prevalent weather conditions. Except for periodic loosening of soil,adding manure, weeding etc these trees need little maintenance. By planting the saplings just prior to or during monsoon it was seen that the watering during dry seasons could be dispensed with and a survival rate of above 70% was achieved.

M/s APFDC having vast experience in the field have rendered good consultancy service and executed the job in the most economical way.

At this point of our discussion it is worthwhile to make a mention of an interesting phase of our programme. At Bhadrachalam town which is 25 kms from HWP(M) site, a paper board industry under the management of ITC is functioning. They showed keen interest in our green belt development and made a proposal for taking up the required plantation with a condition that they be allowed to fell some portions of plantation every five years for use as raw material in their factory and they would pay for such quantity of timber. This looked commercially attractive, but the aspect of felling trees in certain areas would defeat the purpose of continous vegetal cover in the green belt area, and hence this proposal of the Paper Board factory could not be agreed to.

The trees mainly chosen in the programme for green belt were for block plantation as well as for wind breaking. Wind breaking plants were felt essential to resist the flow of toxic gases through air. Following trees were chosen:-

A. Block plantation:

1. Sisso 2. Bamboo 3. Babul 4. Rita 5. Pongamia 6. Terminalia 7. Glyricidia/Kigetia

B. Wind Barriers:
1. Eucalyptus 2. Subabul 3. Rain tree 4. Peltophorm 5. Neem 6. Tamarind 7. Mango 8. Wood Apple 9. Casurina Equesetifolia (Sani) 10. Albizialebbeck 11. Cassia Siamia 12. Accacia Auriculiformis.

The density of plantation is 1100 trees per hectare. The programme was commenced from the monsoon of 1988 and so far 3,25,000 trees have been planted covering an area of about 302 hectares. Balance area is 80 hectare. Besides the plantation taken through APFDC, plantation was taken up from 1985 itself departmentally and about 10,000 trees were planted within the plant premises wherever vacant areas were available.

Considering the severe summer condition the experience regarding plantation so far has been good and it is expected that trees will be self-sustaining in future without much maintenance. Till that time, important precautions were taken regarding protection of growing trees from spreading dry grass fire.

In view of the vulnerability of certain species of trees to certain insects and diseases, for better survival, mixed plantation has been adopted. One of the fastest propagating and proliferating plants is Subabul which within a year of plantation multiplies thousand times by dispersion of seeds through wind. This is one of the plants which can be commercially exploited for fodder, wood for paper industry etc. By creating dense forest these trees resist soil erosion. This aspect is of importance especially for the area around ash disposal system which is flood prone. The area around ash bund as well as the natural streams nearby are located in soil subjected to erosion. It is felt that subabul trees and other fast growing varieties will effectively conserve the soil essential for the structural stability of ash bund.

In addition to the planting of avenue trees an area of 45 Ha of open land in Colony has been planted with trees through M/s APFDC. Thus emphasis has been laid on combating pollution due to CO2, H2S and SO2 on natural biogeochemical cycles. What is of utmost importance is to study the impact of the pollution control measures and make further improvements in this regard.

H2S RELEASED THROUGH EFFLUENT:

This is oxidised by chlorinating the effluent so that H2S content let out in the natural stream is within permissible limits.

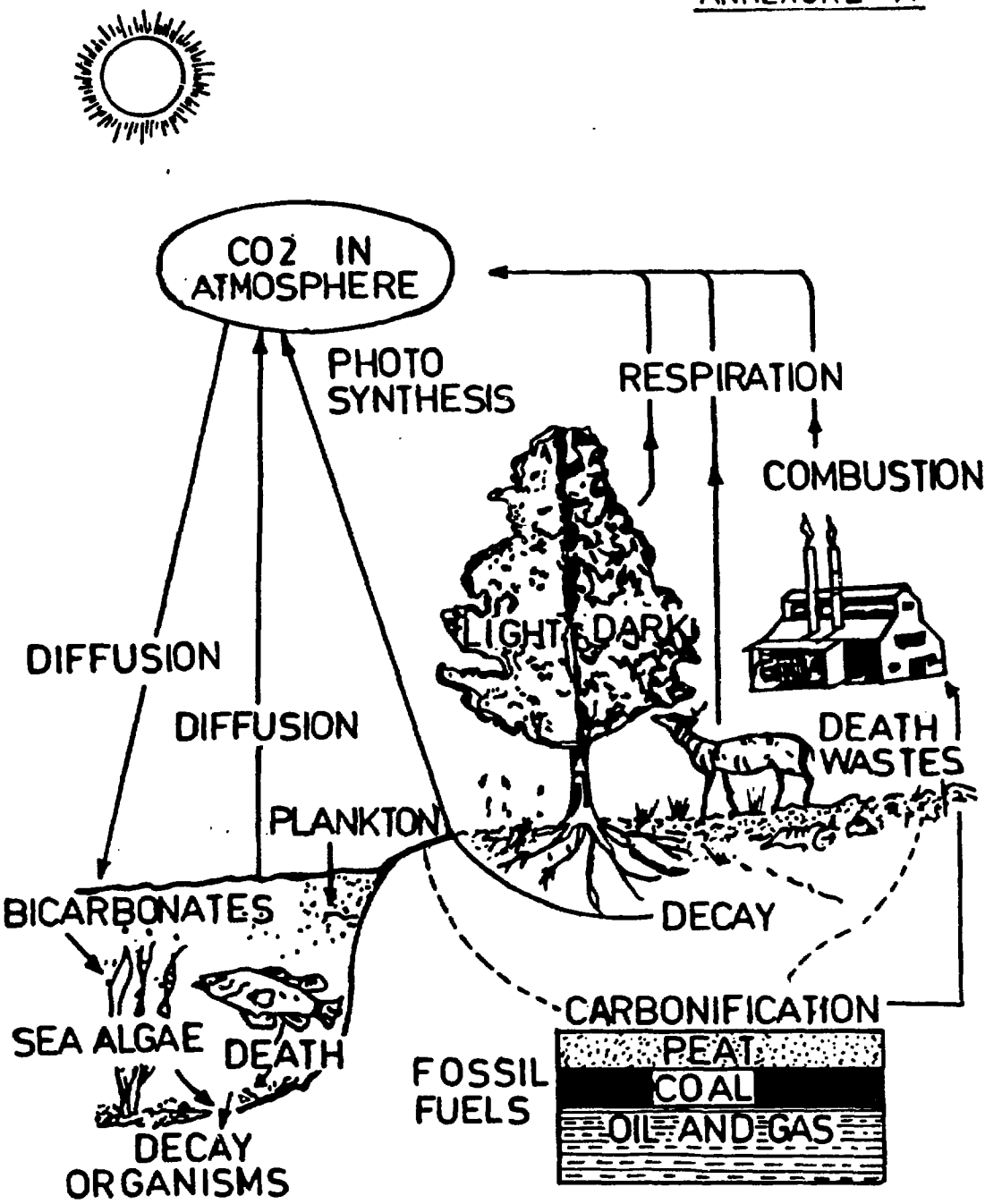
In order to combat the toxic waste materials we have to depend on natural cycles, with the interaction between biotic and abiotic components of ecosystem. It is the only proven method of sustaining life as evident over millions of years. Man can alter or control the environment but he in no way can affect his own dependence on the environment.

Some difficulties were experienced while executing the work. The villagers in the neighbourhood were disrupting the fencing being provided and would force their cattle in the plantation area for grazing. During monsoon low lying areas were getting flooded.

CONCLUSIONS:

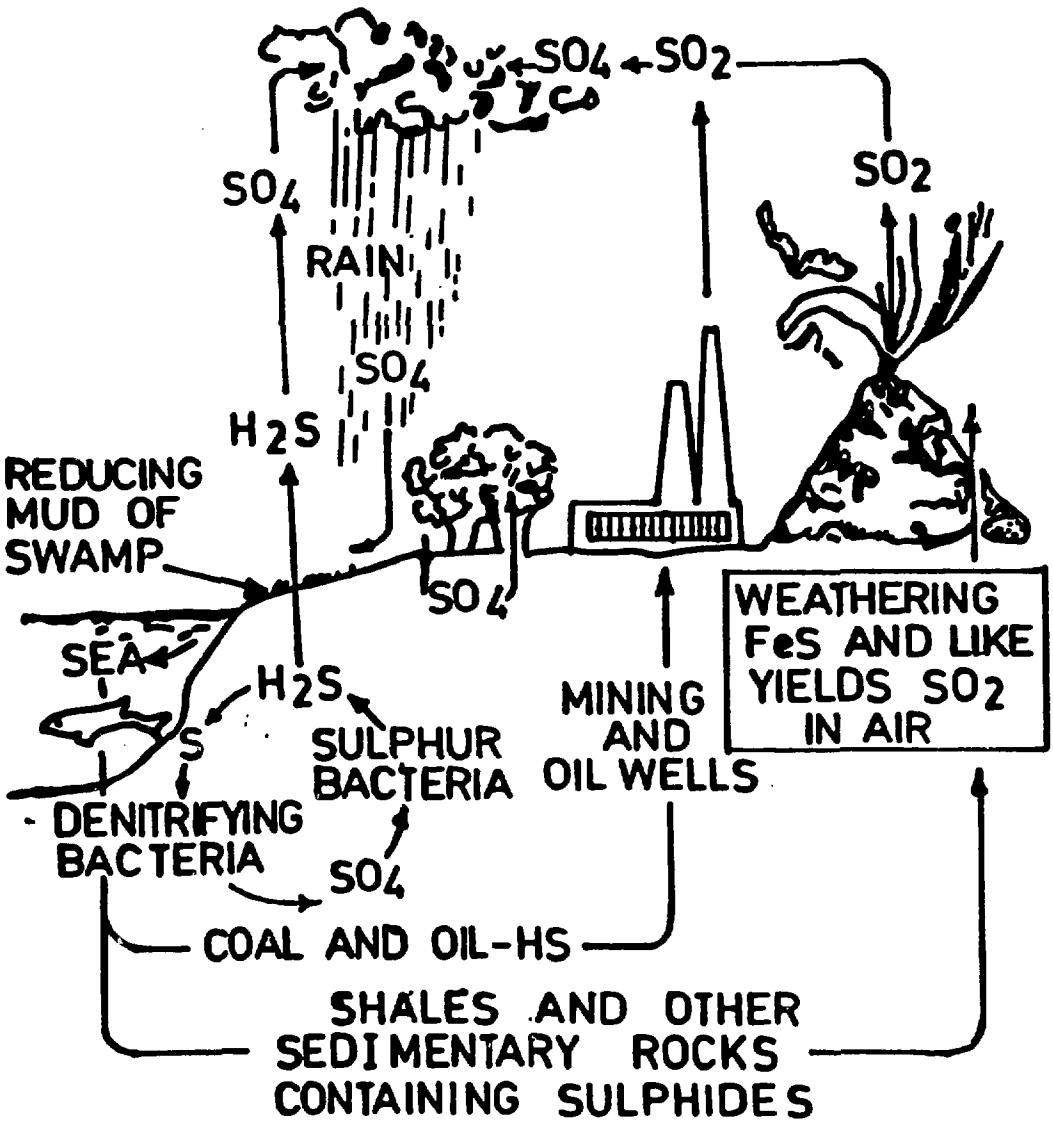
It is heartening to note that there has been an awakening world wide regarding environmental degradation. Provision of suitable tree plantation as a Green Belt around a chemical industrial plant is a proven remedy to minimize the impact of gaseous effluents in addition to retain green cover in the area. In this direction the efforts made at HW Plant Manuguru from a very early stage during execution can be seen as a good example.

ANNEXURE 'A'

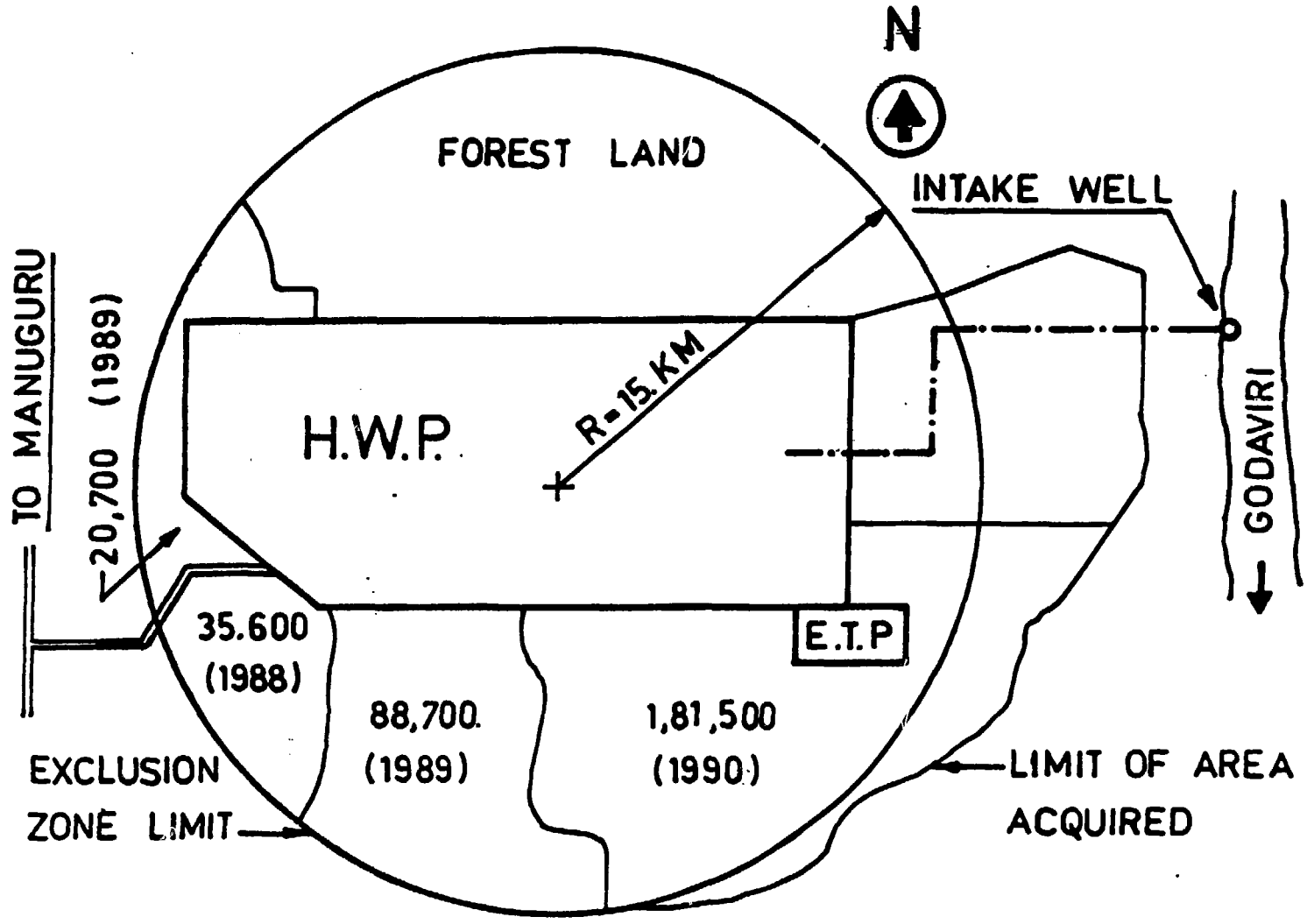


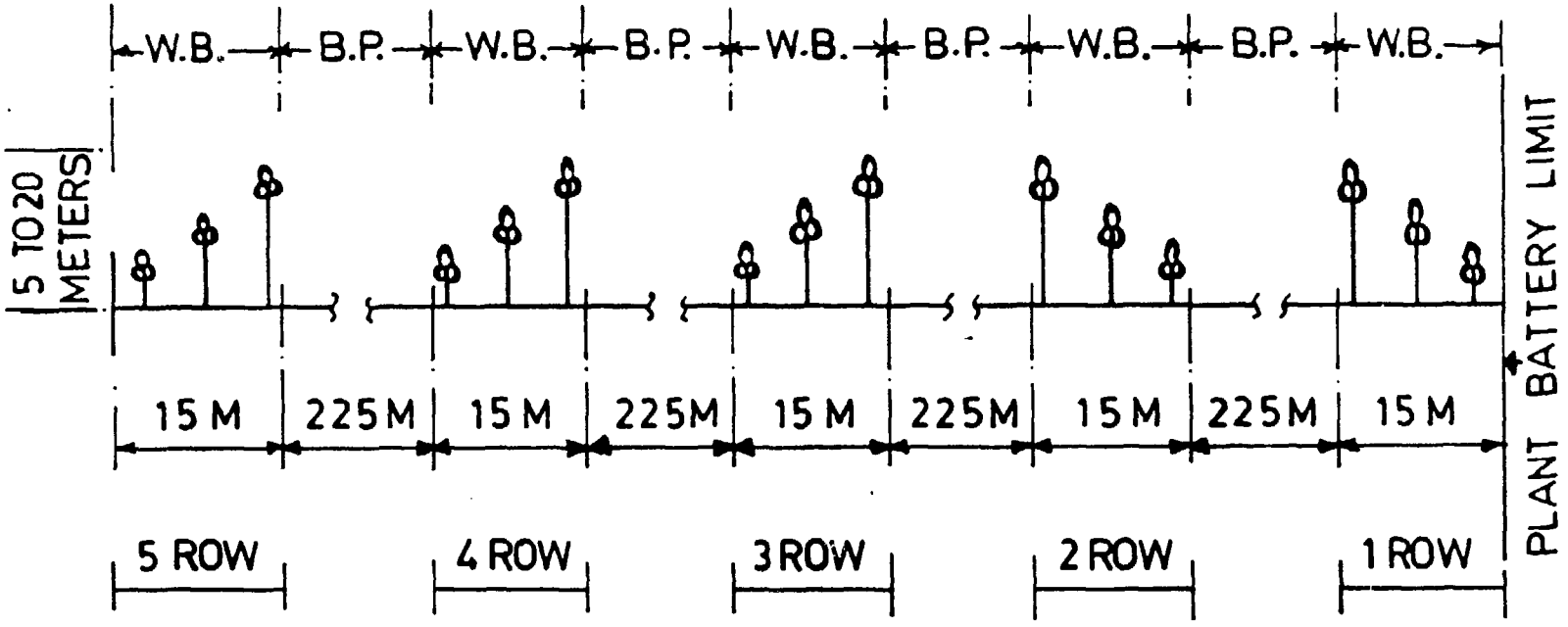
THE CARBON CYCLE

ANNEXURE 'B'



THE SULPHUR CYLLE


N
FOREST LAND
INTAKE WELL
TO MANUGURU
20,700 (1989)
H.W.P.
R=15 KM
GODAVIRI
E.T.P
35.600
(1988)
88,700
(1989)
1,81,500
(1990)
EXCLUSION
ZONE LIMIT
LIMIT OF AREA
ACQUIRED



W.B.—WIND BARRIERS

B.P.—BLOCK PLANTATION

SKETCH FOR WIND BARRIERS AND BLOCK PLANTATION