2. Experimental - Based upon the topographical and hydro-geological survey, Socio-Economical survey aided by GPS, Sokkia Total Station Survey and with the help of some field and historical data, some suitable areas were demarcated along the Futiary River catchment for construction of a composite model comprising a Cement Concrete Check dam followed by a Collector Well or an Infiltration Gallery and a sub-surface Dyke. The infiltration gallery or collector well will be used to collect the water from the river after disinfection process. The potential recharge from a groundwater recharge structure has been defined as the volume of water retained and percolated from upstream of the hydraulic structure (Scanlon et al., 2002). The potential recharge was estimated using water balance equation and Water Table fluctuation method describes below. Considering the pertinent parameters of hydrologic cycle The Principle of the Water Table Fluctuation (WTF) method is based on concept that increase in groundwater level in wells or aquifers is proportional to the recharge water in the water table. The recharge factor included to groundwater (RGw) may be expressed as:

$$\mathbf{RGw= S\times \Delta \mathit{Wt} \times Aca} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\mathbf{(1)}$$

where, S is the storativity, ΔWt is the fluctuation in water-table. Aw is the catchment area.To obtain the volume of water recharged to the aquifer, the catchment area of the all the storage combined together to estimate the cumulative recharge .After calculating the recharge socioeconomic factor integrated for recharge assessment. The strength of hydro-economic modelling lies in its capacity to integrate key biophysical and socio-economic components within a unified framework. The complexities involved in water allocation and use in a river basin or sub-basin require a whole-of-system approach to achieve an allocation outcome which is sustainable, efficient and equitable. A better understanding of water supply and demand, and its value in different sectors, is essential if alternate policies are to be developed. The modelling framework presented in this section is based on the integration of an allocation and economic models (Figure.2). The framework consists of three main components:

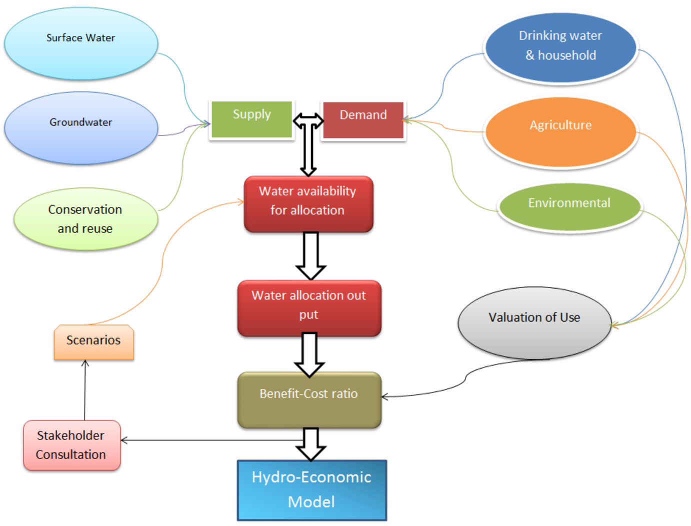

Figure.2. Modelling Frame wok

3. Results and Discussion –

Hydrological Impact: The surface water and groundwater interaction in connection to the potential recharge from surface water bodies to the groundwater storage was studied with importance, both under natural and groundwater recharging systems. The primary approach was to study the interaction of all the surface water bodies on the groundwater table fluctuation under the influence of groundwater recharging structures and methods. While the secondary objective was to determine the time required for a drop of water infiltrated from the storage under natural recharge conditions to reach the groundwater storage. The seasonal variation of water table maps reveals that the in the areas having both natural storage structures and ground recharge structure, the groundwater table increased significantly. Based on the water table data collected during July 2010 to August , 2014 (rainfall during the period is 1106-1186 mm), it was established that 21 tube wells/open wells (80%) out of the designated 26 tube wells and open wells has direct impact on recharged water. The net rise in water table during this period was 1.5 m. For a short period, most of the water recharged from. Study reveals the value of groundwater table depth before and after construction of groundwater recharge structure, in 2010 same monitoring well shows net annual rise in 1.4 meter. Groundwater recharge is estimated in the tune of 7.85 % to 9.15 % of the annual rainfall using WTF method based on the historical data.

Socio- Economic Impac :A long-term bottom-up approach is visualized for the development of cost effective technology for recharging in over exploited ground water resources in at Ghutlia. It is expected to generate the conditions and provide lessons for follow-up in the region in other villages. In order to have a holistic documentation of the project implementation process at Ghutlia, it was decided to conduct a baseline survey for evaluation of project benefits to the inhabitants of Ghutlia in the long-run. For the same purpose, semi-structured questionnaires have been administered among all the villagers along with Focused Group Discussions and personal interviews with key informants. The data analysis of this survey delineates the social and economic background of Ghutlia and provides a careful examination of strengths and vulnerabilities associated with this particular intervention. Post construction of Integrated Cost effective model monthly household income of the village increased significantly due to perennial availability of water for irrigation most of villagers who had the agricultural lad cultivated three time in a year, previously it was on time in a year. Majority of villager shifted monthly income group from Indian rupees 0-500 to 2000-10000.

4. Conclusions –

In this paper a hydro-economic modelling framework is presented which accounts for the interactions of hydrology, water use and economic processes. The modelling framework may be used for optimum allocation through prioritization for future use based on integrated cost-effective recharge model using surface and ground water in similar type of terrain condition. This study reveals that the excessive use of natural resource will affect the environment and ultimately it will reach in a stress condition at a greater scale. It is stated that in semi-arid and water scare region like Purulia district the extraction of groundwater is more and due to topographical feature and undulating variation in presence of rocky terrain surface discharge is more than natural recharge. Therefore the research work was carried out with the objectives to develop a frame work with plan and design, a composite model with cost-effective groundwater recharging structures in terms of economic feasibility has been applied and validated thereof. Four types of water recharging structures, i.e., check dam with recharge multipurpose collector well with Infiltration gallery has been considered in this study. The detailed cost analysis of proposed composite model of cost effective technology revealed that the integration of different groundwater recharging structure using local material is more cost effective rather than installation of single structure. It is also very much efficient than single recharging structure. The cost benefit analysis also stated that above designed structures are feasible because they have BCR value more than 1.Socioeconomic evaluation also reveal the rice in income among the vilalgers.

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