

CHAPTER-4

Methodology and Rationality of the study

4.1 Methodology

To add mobility in the movement of physically challenged people, motor driven or electric operated wheel chair has gained much interest not only in the world but also in Bangladesh. To be independent of national grid and to achieve environmental sustainability, PV-based wheel chair will be a perfect solution.

A study was conducted by a group of student of EECE Dept of MIST in the year 2013 to find empirical evidence of techno-economic feasibility of introducing PV-based wheel chair. Documentary evidence has also been articulated to finalize the designing of the project and identifying the environmental impact of it. Data was collected from various sources. A mixture of qualitative and quantitative methodological approaches based on interview with local experts involved in PV technology has been applied. The findings of this empirical work led to the formulation of recommendations to amplify benefits and minimize the limitations of the project.

A general survey had been conducted among disabled people who are using wheel chairs and manual three-wheelers. They had been interviewed on some specific questions and their problems/needs had been investigated and identified. They came out with their problems, requirements, opinions as well. Basically these are the requirements from the physically disabled persons using manual wheel chair/three-wheelers. The opinions and advices of the experts working with the disabled people are also taken in to consideration. Their overall needs and requirements can be described as: the three-wheeler should be power driven to avoid physical force, it can be used at any time either in day or night, having lighter weight with better safety and stability, easy to control and better maneuverability in case of narrow space/roads, comfortable, all terrain traffic ability/mobility and suitable for indoor as well as out-door use, having available solar power to drive the three-wheeler in average 15~20 km distance per day,

able to protect the user from the adverse environment like sunshine, rain etc., having availability of spares, ease of maintenance and finally cheaper price.

4.2 Necessity of Mobility in Wheel Chair

A lot of difficulties and hassles involved with the mobility of the physically challenged people in the society. It has been observed that physically disabled people are basically using some assistive devices like, crutches, artificial limbs or legs etc. and manual wheel chairs or three-wheelers for their day-to-day movements. But, these wheel chairs or three-wheelers are crude or of inefficient in design; not very much suitable for outdoor use or common terrain in the country like Bangladesh. Undoubtedly these manual wheel chairs or the three-wheelers are the blessings for crippled people but in the question of humanity, it is just “to add insult to injury”. Be-cause, commonly found manual wheel chair or three-wheeler has a basic problem that the occupant must use physical force to turn the wheels. This action is physically stressful, can result in muscle and joint pain and degradation, torn rotor cuffs, repetitive stress injury, and carpal tunnel syndrome; which causes secondary injury or further disability.

Again, Use of conventional energy sources and rapid development of the present world have some bad impacts on the surroundings and environment, like depleting limited energy resource, damage of ecosystem, environment pollution, global warming and so on. As a result, Designing for Environment (DFE) is the crying need of the time and it is very much necessary to develop environment friendly equipment or transport for better living, for better world. The incredible capacity to adapt to difficult circumstances has led to wonderful inventions, particular beneficial to individuals with mobility problems. Mobility scooters have changed the way in which people in wheelchairs are able to maneuver.

4.3 Necessity of Motor driven Wheel Chair

The main problems with the presently available three-wheelers are that these are manual, needs physical force to drive it; causes secondary injury such as upper extremity repetitive strain injuries, vibration exposure injuries, pressure ulcers, accidental injuries etc. There are lots of technical draw-backs of this manual three-wheeler too. However, the main drawbacks can be pointed as; crude or of inefficient design, biomechanics are not well considered, lack of safety measures, over weight and size, not suitable for outdoor use and no shed for protection to the user against adverse environment like sunshine, rain etc.

4.4 Prospect of Solar-based Wheel Chair

Scarcity of energy is a common problem in all over the globe due to lack of conventional energy sources. So, Eco-friendly renewable energy like solar power can be the alternative and solve the power problem to some extent. Availability of solar energy radiation is the most vital consideration for designing and development of a solar system or solar equipment at any location on the earth. Rated solar radiation power received by the earth surface is (global radiation flux) 1000 W/m². Availability of solar energy radiation in all over the country is very much encouraging for developing a solar three-wheeler for disabled people in Bangladesh. The geo-location of Bangladesh is in favor of receiving highest amount of solar radiation round the year. It is situated between 20.30-26.38 degrees north latitude and 88.04 - 92.44 degrees east, which is an ideal location for solar energy utilization. Solar radiation mapping shows that the daily average solar radiation varies between 4-6.5 kWh/m². Maximum amount of radiation is available on the month of March-April and minimum on December-January.

The researches have been going on to produce solar car, solar plane and so on. In the transportation sector, the use of solar energy faces different problems, such as the limited space for panel, batteries, transmission problems etc. Many in the world attempted to carry out the idea of a solar car, jointly forming an association and establishing a yearly race for solar powered cars, in different country each year. These works show the design parameters for a solar car only and no significant achievement yet for a suitable solar three-wheeler for disabled people. Since

the solar power system suits well with the minimal power consumption, the development of the solar three-wheeler would be very much feasible as it as mini transport needs comparatively smaller power for the power system. A 100 W solar panel is good enough to support the daily power requirement. However, the most challenging part of the solar three-wheeler project is to use the limited solar energy effectively, maximize its efficiency and ensure suitability/traffic ability on our terrain. Successful implementation of the project will depend on how successfully and exactly the problems are identified.