SOLAURA

MODULAR SOLAR ENERGY + WIND ENERGY HARNESSING PAVILLION IN FIJI

WIND MILLS ARE A STUNNING VIEW, AND SO IS ANY ELEMENT THAT ROTATES IN THE WIND. WITH THEM BEING SO HIGH UP IN THE SKY, WHY NOT INCORPORATE SOLAR ENERGY HARNESSING IN IT. THIS SIMPLE THOUGHT GAVE BIRTH TO SOLAURA. WITH ITS AERODYNAMIC STRUCTURE AND CONSCIOUS PLACEMENT.

THIS DESIGN AIMS TO INCORPORATE THE PRINCIPLES OF MODULARITY, RENEWABLE ENERGY GENERATOR, AND SUSTAINABLE PRACTICE WHILE KEEPING IN MIND THE HUMAN EXPERIENTIAL FACTOR IN MIND. GIVING A CALM AND PEACEFUL VIEW OF SKY, WITH MULTIPLE KITE-LIKE MODULES, SEEMINGLY FLOATING, AND ROTATING HELPS HUMANS ENGAGE MORE WITH IT.

THE DESIGN ALSO KEEPS IN MIND THE NEEDS AND HARDSHIPS OF MAROU VILLAGE. IT HELPS BY PROVIDING A REFUGE AREA, WATER FILTRATION, AND RETENTION ELEMENTS, FARMING ZONES, WHILE ALSO INCREASING THE QUALITY OF LIFE OF PEOPLE BY PROVIDING COMMUNITY ZONES LIKE GATHERING SPACES, DEDICATED PUBLIC SEATING AND INTERACTIVE LIGHT SHADOW PLAY.

THIS DESIGN ADDS A NEW CHARACTER AND VALUE TO THE MAROU VILLAGE, WHILE RESPECTING THE EXISTING CULTURE.

THE DESIGN USES MATERIALS LIKE ALUMINIUM ALLOY AND GALVANISED STEEL FOR ITS STRUCTURE AND IT ALSO USES FIBERGLASS, 3D PRINTED MATERIALS.

THE STRUCTURAL MATERIALS ARE PURELY FOR SUPPORT OF THE STRUCTURE.

OTHER THAN THE DESIGN INSTALLATION, WATER DOME, HAVE ALSO BEEN INTRODUCED IN THE SITE.

OTHER THAN THAT LOCAL AND NATIVE MATERIALS FOR EARTH BERMED HOUSES, AND LANDSCAPE HAVE BEEN USED. SEEDS OF NATIVE PLANTS LIKE FIJI SEDGE, FIRE FLAG, BEACH MORNING GLORY, NATIVE SWAMP GRASS, DALO, SHELL GINGER, FIJI WILD HELICONIA, BEACH NAUPAKA HAVE ALSO BEEN INTRODUCED.

COMMUNITY EXPERIENCE HAS BEEN ESPECIALLY KEPT IN MIND, BY PROPOSING A COMMUNITY BASED ACTIVITY ZONES, RATHER THAN A SINGULAR PIECE OF INSTALLATION. FARMING ZONES AND STORAGE IS IN SUCH A PLACE THAT OVERLOOK THE ENTIRE REGION. THE EARTH BERMED HOUSES ARE ALSO SURROUNDED BY ALL THE THINGS REQUIRED. RAIN GARDEN AND WALKWAYS CREATE A HUMAN INTERACTION ZONE THAT IS HELPFUL AND GIVES A CALM MIND. THE INSTALLATION ITSELF HAS PUBLIC AND PRIVATE SPACES, BOTH OVERLOOKING EACH OTHER BUT MAINTAINING THE SANCTITY OF THEIR OWN AS WELL.

THE DESIGN INCORPORATES TECHNOLOGIES LIKE :

1. FLEXIBLE PHOTOVOLTAIC CELLS : THESE HELP IN INCREASING THE AESTHETIC VALUE OF THE DESIGN WHILE DOING THE NEEDFUL

SYSTEM INPUT : THE MODULE ITSELF

SYSTEM OUTPUT : BATTERY STORED UNDER THE PAVILLION

2. WATER DOME : THIS IS USED FOR FILTERING AND STORING OF WATER

ENERGY GENERATED

SYSTEM OVERVIEW:

TOTAL MODULES: 2,500

EACH MODULE INCLUDES: 6 PHOTOVOLTAIC (PV) CELLS (EACH 15 CM × 15 CM)

ONE 60 CM × 60 CM × 20 CM WIND TURBINE

INSTALLATION HEIGHT: 6 METERS

1. SOLAR ENERGY GENERATION

EACH PV CELL AREA = 0.15 M × 0.15 M = 0.0225 M²

TOTAL PV AREA = 2,500 MODULES × 6 CELLS × 0.0225 M² = 337.5 M²

AVERAGE SOLAR INSOLATION IN FIJI = 5.5 KWH/M²/DAY

PV EFFICIENCY = 18%

CALCULATION: DAILY SOLAR ENERGY = 337.5 M² × 5.5 KWH/M²/DAY × 0.18 ≈ 334 KWH/DAY

2. WIND ENERGY GENERATION

FRONTAL AREA OF EACH WIND MODULE = 0.6 M × 0.6 M = 0.36 M²

AVERAGE WIND SPEED AT 6 M HEIGHT IN FIJI = 4.5 M/S

AIR DENSITY = 1.225 KG/M³

TURBINE EFFICIENCY (BETZ LIMIT × MECHANICAL) = 30%

POWER PER MODULE:

P = 0.5 × 1.225 × 0.36 × (4.5)³ × 0.3 ≈ 2.0 W/MODULE

TOTAL DAILY WIND ENERGY:

2.0 W × 24 H × 2,500 = 120,000 WH/DAY = 120 KWH/DAY

TOTAL DAILY ENERGY GENERATION

SOLAR - 334kWh/day

WIND - 120kWh/day

TOTAL - 454kWh/day

FOR THE IMPLEMENTATION PROCESS ALL THE PARTS WOULD NEED TO TRANSPORT AND INSTALLED THERE. THE MAIN INVOLVEMENT OF THE PEOPLE WOULD BE IN THE LANDSCAPING AND MAINTAINING OF THE DESIGN PROPOSAL.

THE MATERIALS AND TECHNIQUES PROPOSED SHOULD BE LONG LASTING, AS THEY HAVE BEEN DESIGNED KEEPING FLOODS, STORM, AND DROUGHT IN MIND. ROUTINE MAINTENANCE WOULD BE REQUIRED.

THE PROPOSAL SHOULDN’T AFFECT THE LANDSCAPE AND ECOSYSTEM NEGATIVELY AS IT HAS BEEN CONSCIOUSLY MADE KEEPING ALL LANDSCAPE AND SITE FEATURES IN MIND.