Technical Note No. 2

Delta Blue Carbon Project Phase-1 (DBC-1) Carbon Modeling and Carbon Calculations

1. Carbon Modeling

To develop its carbon model at the time of PD preparation, DBC-1 project proponents collected field data from real world planted mangroves existing in the Indus delta. The ages of these plantations ranged from 1-30 years and were spatially dispersed throughout the delta area. The growth data comprised of *Avicennia marina, Rhizophora mucronata* species and other mangrove species found in the Indus delta. The planted mangroves had got themselves established in the prevailing bio-physical and socio-economic conditions of the delta. These for example include climatic conditions (temperature levels, rainfall, aridity, humidity, ambient air, etc.), salinity levels, tidal fluctuations, inundation, wave action, soil and other edaphic conditions, the existing fresh water and sediment regimes into the delta, and other relevant site conditions that could affect mangrove growth such as human and livestock influences.

Using this data, mangrove and wetland experts of DBC-1 project (having more than three decades real world experience doing mangrove restoration and growth measurement work in the delta area) and Dr. Igino Emmer of Silvestrum Climate Associates (the lead author of VCS approved VM0033 Methodology for Tidal Wetland Seagrass Restoration) developed a conservative and calibrated biomass and carbon growth model for the Indus delta planted mangroves and used it for ex-ante carbon calculations in DBC-1 project PD.

Model calibration has been done over a wider field collected data set that is based on species and site conditions of the Indus delta. As such, DBC-1 project carbon model has broader regional and temporal applicability as well as higher predictive values.

The biomass and carbon growth model has been rigorously checked by AENOR, a VERRA approved Validation and Verification Body (VVB), and also cross-checked by the technical team of VERRA itself. Both these third party and independent entities after their thorough analysis have validated DBC-1 project carbon model.

2. Environmental Integrity of Carbon Calculations

Biomass carbon calculations of DBC-1 project are also based on field collected real world data which has been collected in different sample plots dispersed throughout the project area. This data has been collected using very strict SOPs for data collection in the field. The project has developed and makes use of an elaborate and strict protocol for data collection as well as data processing and analysis which it implements in its letter and spirit. This protocol has an in-built QA/QC mechanism which is implemented in the field as well as in the office by qualified and real expert teams of Indus Delta Capital (IDC) and Sindh Forest Department.

Making use of this cross-checked and verified data from field, carbon calculations are done using the equations given in the VCS approved VM003 Methodology and its relevant Modules.

To make its soil organic carbon (SOC) calculations conservative, the project again uses VM0033 Methodology given SOC sequestration default factor. While most of the SOC in the Indus delta area is autochthonous, the project has made a deduction of over 92 % for its SOC being allochthonous. This makes DBC-1 SOC estimate conservative.

The combination of biomass carbon based on real world field collected data (collected, processed and analyzed under very strict QA/QC) and a conservative SOC figure, help us ensure the environmental integrity of our carbon calculations. We let our auditors and verifiers to thoroughly check our field collected data through their independent field teams and do hundred per cent checking of our carbon calculations.

To account for any existing baseline vegetation in the project area, DBC-1 project makes a deduction of 1.1% from its GHG calculations and claims only net GHG carbon removals after making this deduction.

DBC-1 project also does not overlook the environmental costs of natural or anthropogenic disturbances during our mangrove forests' lifetime, and estimate and take note of greenhouse gas (GHG) emissions associated with our restoration work. We use life cycle assessment approach to quantify the carbon footprint of setting up DBC-1 project. We also make deductions for any areas that are initially planted and later on get eroded. In our carbon calculations we ensure that our GHG removals are net of eroded areas.

The project uses physical rotation length for its planted areas and does not undertake any thinning or commercial harvesting in its planted areas. Therefore, there is no reduction in its sequestered biomass carbon at any point during DBC-1 project lifetime.

DBC-1 project ensures that its carbon credits have very high environmental integrity by making sure that its carbon credits are fully aligned with the 10 core carbon principles of Integrity Council for Voluntary Carbon Market (ICVCM). For this, the project has put in place Governance Mechanism (effective project governance, proper tracking, transparency, and robust third-Party validation and verification) so as to create Carbon Removals Impact (through additionality, permanence, robust quantification of emission reductions and removals and no double counting), and Sustainable Development Impact (sustainable development benefits and safeguards, and contribution to net zero).

Some of the specific steps taken by the project for ensuring high carbon removal impact include: (1) not ignoring the time needed for trees to reach their carbon capture potential; (2) not ignoring the GHG emissions involved in setting up our project; (3) using the carbon capture potential per tree planted, thereby ignoring limitations at the forest ecosystem level; (4) reporting and using tree losses due to erosion in net carbon calculations; (5) taking note of other inevitable human and climatic disturbances via leakages estimation and AFOLU Non-permanence Risk Assessment as well as making buffer deductions; and (6) having mitigation strategies in place against any future climatic changes which may lead to decrease in fresh water and sediment supply and consequent increase in salinity in the delta area.