

Task 3: Logical transformation - ER

Step 1: Strong entity

Reserve: **ReserveID** (pk), ReserveName, ReserveLocation, ReserveSize

Compliance Regulation: **Com_RegulationID** (pk), Com_RegulationDescription, Com_RegulationCertificateNumber.

Organization: **OrganizationID** (pk), OrganizationName, ManagerName, ManagerContactNumber.

AnimalSpecies: **SpeciesID** (pk), SpeciesName, SpeciesBinomialName.

Habitat: **HabitatID** (pk), HabitatName, HabitatDescription.

Conservation Status: **Cons_StatusID** (pk), ConservationName, ConservationDescription.

Animal: **AnimalID** (pk), AnimalName, AnimalGender, AnimalBirthDate, AnimalDeathDate.

Staff: **StaffID** (pk), StaffName, StaffPosition, StaffSalary.

Tour: **TourID** (pk), TourName, TourCost, TourDuration.

Visitor: **VisitorID** (pk), VisitorName, VisitorCountry.

Step 2: Weak entity

Vehicle: **ReserveID** (pk,fk), **VehicleRegoNumber** (PK), VehicleCapacity, VehicleType.

Step 3: One - to - one relationship

There are no one - to - one relationships.

Step 4: One - to - many relationship

Animal Species: **SpeciesID** (pk), SpeciesName, SpeciesBinomialName, **AnimalID** (FK), **Cons_StatusID** (FK), **HabitatID** (FK).

Reserve: **ReserveID** (pk), ReserveName, ReserveLocation, ReserveSize, **Com_RegulationID** (FK)

Step 5: Many - to - many relationship

FundDetail: **ReserveID** (pk, fk), **OrganizationID** (pk, fk), FundingDate, FundingAmount.

WorksWith: **StaffID** (pk, fk), **AnimalID** (pk, fk).

PackageTour: **TourID** (pk,fk), **PackageTourID** (pk,fk).

Step 6: Multi-valued Attributes

ObservationComment: **SpeciesID**(pk, fk), **ReserveID** (pk, fk), **StaffID**(pk, fk), **CommentID** (PK), Comment.

StaffYearExperience: **AnimalID**(pk, fk), **StaffID** (pk, fk), **AnimalName**(PK), YearExperience.

Step 7: Associative entity / ternary relationship

Observation: **ReserveID** (pk, fk), **SpeciesID** (pk, fk), **StaffID** (pk, fk), ObservationDate, ObservationTime.

Incident: **IncidentID** (PK), **ReserveID** (fk), **AnimalID** (fk), **StaffID** (fk), Event/Occurrence.

Booking: **BookingID** (PK), **TourID**(fk), **VisitorID** (fk), **StaffID**(fk), **VehicleRegNumber** (fk), **ReserveID**(fk), BookingDate, BookingTime.

Repeated step 2 - 7:

Step 5: Many - to - many relationship

BookingInvolvesVisitor: **VisitorID** (pk, fk), **BookingID** (pk, fk).

AnimalHasIncident: **IncidentID** (pk, fk), **AnimalID** (pk, fk).

Step 6: Adding multi-valued Attributes

Requirement: **BookingID** (pk, fk), **VisitorID**(pk, fk), **Requirement** (PK), Requirement.

Final List of Table:

Reserve: **ReserveID** (pk), ReserveName, ReserveLocation, ReserveSize, **Com_RegulationID** (FK)

Compliance Regulation: **Com_RegulationID** (pk), Com_RegulationDescription, Com_RegulationCertificateNumber.

Organization: **OrganizationID** (pk), OrganizationName, ManagerName, ManagerContactNumber.

Animal Species: **SpeciesID** (pk), SpeciesName, SpeciesBinomialName, **AnimalID** (FK), **Cons_StatusID** (FK), **HabitatID** (FK).

Habitat: **HabitatID** (pk), HabitatName, HabitatDescription.

Conservation Status: **Cons_StatusID** (pk), ConservationName, ConservationDescription.

Animal: **AnimalID** (pk), AnimalName, AnimalGender, AnimalBirthDate, AnimalDeathDate.

Staff: **StaffID** (pk), StaffName, StaffPosition, StaffSalary.

WorksWith: **StaffID** (pk, fk), **AnimalID** (pk, fk).

Tour: **TourID** (pk, fk), TourName, TourCost, TourDuration.

PackageTour: **TourID** (pk,fk), **PackageTourID** (pk,fk).

Visitor: **VisitorID** (pk), VisitorName, VisitorCountry.

Vehicle: **VehicleRegoNumber** (PK), **ReserveID** (pk,fk), VehicleCapacity, VehicleType.

FundDetail: **ReserveID** (pk, fk), **OrganizationID** (pk, fk), FundingDate, FundingAmount.

ObservationComment: **SpeciesID**(pk, fk), **ReserveID** (pk, fk), **StaffID**(pk, fk).

StaffYearExperience: **AnimalID**(pk, fk), **StaffID** (pk, fk).

Observation: **ReserveID** (pk, fk), **SpeciesID** (pk, fk), **StaffID** (pk, fk), ObservationDate, ObservationTime.

Incident: **IncidentID** (PK), **ReserveID** (fk), **AnimalID** (fk), **StaffID** (fk), Event/Occurrence.

Booking: **BookingID** (PK), **TourID**(fk), **VisitorID**(fk), **StaffID**(fk), **VehicleRegoNumber** (fk), **ReserveID**(fk), BookingDate, BookingTime.

Requirement: **BookingID** (pk, fk), **VisitorID**(pk, fk), **Requirement** (PK), Requirement.

BookingInvolvesVisitor: **VisitorID** (pk, fk), **BookingID** (pk, fk)

AnimalHasIncident: **IncidentID** (pk, fk), **AnimalID** (pk, fk).

Task 4: Logical transformation - EER

Step 1: Strong entities

Program: **ProgramID** (PK), ProgramName, ProgramCost, ProgramDuration.

Student: **StudentID** (PK), StudentName, StudentCountry, StudentEmail.

FundingOrganization: **OrganizationID** (PK), OrganizationName, ManagerName, ManagerPhoneNumber.

TeachingStaff: **StaffID** (PK), TeachingStaffName, StaffSalary.

Step 2: Weak entities

No weak entities.

Step 3: One - to - one relationship

No one to one relationship

Step 4: One to many relationships

No one to many relationships

Step 5: Many - to - many relationships

StudentEnrolProgram: **ProgramID** (pk, fk), **StudentID** (pk, fk), EnrolDate.

Step 6: Multi-valued Attributes

StaffEducationalQualification: **QualificationID** (PK), **StaffID** (pk, fk).

Step 7: Ternary Relationship / Associative entity

No Associative entity.

Step 8a:

Educational Program: **ProgramID** (pk, fk), TargetAudience, CertificateName.

VolunteerProgram: **ProgramID** (pk, fk), CertificateName.

ResearchProgram: **ProgramID** (pk, fk), ResearchName.

ConservationStaff: **StaffID** (pk, fk), ConservationistExpertise,
ConservationistYearOfExperience.

ResearcherStaff: **StaffID** (pk, fk), ResearcherArea, ORCID.

VolunteerStaff: **StaffID** (pk, fk).

Repeat step 2 - 7:

Step 2: Weak entity

No weak entity

Step 3: One - to - one relationship

ResearchProgram: **ProgramID** (pk, fk), ResearchName, **StaffID** (FK).

Step 4: One - to - many relationship

VolunteerProgram: **ProgramID** (pk, fk), CertificateName, **StaffID** (FK).

Step 5: Many - to - many relationship

ResearchProgramRunByConservationStaff: **StaffID** (pk, fk), **ProgramID** (pk, fk).

Funds: **OrganisationID** (pk, fk), **ProgramID** (pk, fk), FundingAmount.

TeachingStaffInvolvesInTeachingProgram: **StaffID** (pk, fk), **ProgramID** (pk, fk).

Step 6: Multi-valued attribute

EducationalRequired: **EducationalRequiredID** (PK), **ProgramID** (pk, fk).

VolunteerRequirement: VolunteerRequirementID (PK), ProgramID (pk, fk).
DataCollectionRequired: DataCollectionRequiredID (PK), ProgramID (pk, fk).

Step 7: Ternary Relationship / Associative Entity.

No Associative entity.

Final list of tables:

Program: ProgramID (PK), ProgramName, ProgramCost, ProgramDuration.

Student: StudentID (PK), StudentName, StudentCountry, StudentEmail.

FundingOrganization: OrganizationID (PK), OrganizationName,
ManagerName, ManagerPhoneNumber.

TeachingStaff: StaffID (PK), TeachingStaffName, StaffSalary.

StudentEnrolProgram: ProgramID (pk, fk), StudentID (pk, fk), EnrolDate.

StaffEducationalQualification: QualificationID (PK), StaffID (pk, fk).

Educational Program: ProgramID (pk, fk), TargetAudience, CertificateName.

VolunteerProgram: ProgramID (pk, fk), CertificateName, StaffID (FK).

ResearchProgram: ProgramID (pk, fk), ResearchName, StaffID (FK).

ConservationStaff: StaffID (pk, fk), ConservationistExpertise,
ConservationistYearOfExperience.

ResearcherStaff: StaffID (pk, fk), ResearcherArea, ORCID.

VolunteerStaff: StaffID (pk, fk).

ResearchProgramRunByConservationStaff: StaffID (pk, fk), ProgramID (pk,
fk).

Funds: OrganisationID (pk, fk), ProgramID (pk, fk), FundingAmount.

TeachingStaffInvolvesInTeachingProgram: StaffID (pk, fk), ProgramID (pk,
fk).

EducationalRequired: EducationalRequiredID (PK), ProgramID (pk, fk).

VolunteerRequirement: VolunteerRequirementID (PK), ProgramID (pk, fk).

DataCollectionRequired: DataCollectionRequiredID (PK), ProgramID (pk, fk).