10.7 List of attendance

Academic level		**Institution**	**Type**	**Attendance**
MSc	Biology and Environmental Resource Management	Deltares	Deltares	Entire Process
MSc	Natural Resources Management	Deltares	Deltares	Entire Process
MSc	Business Administration	Rabobank	Financial	Only First
MSc	Anthropology	FMO	Financial	Only First
Ph.D.	Policy Science	ASC	Research Institute	First and Final
Ph.D.	Policy analysis and system engineering	Deltares	Deltares	Entire Process
MSc	Physical Geography	RWS	Public	First and Final
BSc	Civil Engineering	Deltares	Deltares	First and Final
MSc	Marine Biology	ARCADIS	Private company	Entire Process
MSc	Hydrodynamics	UNESCO-IHE	Research Institute	Entire Process
Ph.D.	Wetland Ecology	Deltares	Deltares	First and Final
PhD	Limnology	Deltares	Deltares	First and Second
MSc	Human Nutrition	ASC	Research Institute	Entire Process
Ph.D.	Tropical Hydrology	BUZA	Public	Only Final
MSc	Psychology	Erasmus University	Research Institute	Only Final
Ph.D.	Civil Engineering	Deltares	Deltares	Only Second
Ph.D.	Biology	Deltares	Deltares	Entire Process

10.8 Equations and units

STOCK: Cash_Balance_softer_condition(t) = Cash_Balance_softer_condition(t - dt) + (Cash_in_softer_condition - Cash_softer_condition) * dt
USDollars = USDollars + (USDollars/year - USDollars/year)*year
USDollars = USDollars + USDollars
USDollars = USDollars
INIT Cash_Balance_softer_condition = 0 USDollars
INFLOWS:
Cash_in_softer_condition = (Revenue_from__Mangrove_use_1+Revenue_from__aquaculture_1)*Government_subsidy_multiplier*Condition_for_payment_2
USDollars/year = (USDollars/year + USDollars/year)*dimensionless*dimensionless
USDollars/year = USDollars/year
OUTFLOWS:
Cash_softer_condition = Restoration_cost_1+Construction_cost_1
USDollars/year = USDollars/year + USDollars/year
USDollars/year = USDollars/year

STOCK: Cash_Balance_stronger_condition(t) = Cash_Balance_stronger_condition(t - dt) + (Cash_in_stronger - Cash_out_stronger) * dt
USDollars = USDollars + (USDollars/year - USDollars/year)*year
USDollars = USDollars + USDollars
USDollars = USDollars
INIT Cash_Balance_stronger_condition = 0 USDollars
INFLOWS:
Cash_in_stronger = (Revenue_from__Mangrove_use+Revenue_from__aquaculture)*Government_subsidy_multiplier*Condition_for_payment
USDollars/year = (USDollars/year + USDollars/year)*dimensionless*dimensionless
USDollars/year = USDollars/year
OUTFLOWS:
Cash_out_stronger = Restoration_cost+Construction_cost
USDollars/year = USDollars/year + USDollars/year
USDollars/year = USDollars/year

STOCK: Net_present__value_softer_condition(t) = Net_present__value_softer_condition(t - dt) + (Change_net_value_softer_condition) * dt
USDollars=USDollars + (USDollars/year)*year
USDollars=USDollars + USDollars
USDollars=USDollars
INIT Net_present__value_softer_condition = 0 USDollars
INFLOWS:
Change_net_value_softer_condition = (Cash_in_softer_condition-Cash_softer_condition)/(1+Net_present_value_Discount_rate)^(time-star_time_1)
USDollars/year = (USDollars/year-UsDollars/year)/dimensionless
USDollars/year = USDollars/year

STOCK: Net_present__value_stronger_condition(t) = Net_present__value_stronger_condition(t - dt) + (Change_net_value) * dt

USDollars=USDollars + (USDollars/year)*year
USDollars=USDollars + USDollars
USDollars=USDollars
INIT Net_present__value_stronger_condition = 0 USDollars
INFLOWS:
Change_net_value = (Cash_in_stronger-
Cash_out_stronger)/(1+Net_present_value_Discount_rate)^(time-star_time)
USDollars/year = (USDollars/year-UsDollars/year)/dimensionless
USDollars/year = USDollars/year

STOCK: Aquaculture(t) = Aquaculture(t - dt) + (Acuaculture__expansion +
Private__reinvestment_rate - Deteroriation__rate) * dt
ha=ha+(ha/year+ha/year-ha/year)*year
ha=ha+ha
ha=ha
INIT Aquaculture = 0 ha
INFLOWS:
Acuaculture__expansion = Planned__expansion_area/Time__expansion
ha/year=ha/year
Private__reinvestment_rate = Deteriorated__Area/Reinvestment_in__acuaculture_time
ha/year=ha/year
OUTFLOWS:
Deteroriation__rate = Aquaculture/Deteroriation_time
ha/year=ha/year

Area_under_restoration(t) = Area_under_restoration(t - dt) + (Restoration__rate -
Failure_rate - Maturation__rate) * dt
ha=ha+(ha/year-ha/year-ha/year)*year
ha=ha+ha
ha=ha
INIT Area_under_restoration = 0 ha
INFLOWS:
Restoration__rate = if time < Activation_policy_restoration_Year_20 then 0 else
Gap__restoring/Restoration__time
ha/year=ha/year
OUTFLOWS:
Failure_rate =
(Area_under_restoration/Failure_time)*(Probability__of_restoration__failure)
ha/year=(ha/year)*dimensionless
ha/year=ha/year
Maturation__rate = (Area_under_restoration/Maturation_time)*(1-
Probability__of_restoration__failure)
ha/year=(ha/year)*(1-dimensionless)
ha/year=ha/year

STOCK: Deteriorated__Area(t) = Deteriorated__Area(t - dt) + (Failure_rate +
Deteroriation__rate - Restoration__rate - Private__reinvestment_rate) * dt
ha=ha+(ha/year+ha/year-ha/year-ha/year)*year
ha=ha+ha
ha=ha

INIT: Deteriorated__Area = 0 ha
INFLOWS:
Failure_rate =
(Area_under_restoration/Failure_time)*(Probability__of_restoration__failure)
ha/year=(ha/year)*(dimensionless)
ha/year=ha/year
Deteroriation__rate = Aquaculture/Deteroriation_time
ha/year=ha/year
OUTFLOWS:
Restoration__rate = if time < Activation_policy_restoration_Year_20 then 0 else
Gap__restoring/Restoration__time
ha/year=ha/year
Private__reinvestment_rate = Deteriorated__Area/Reinvestment_in__acuaculture_time
ha/year=ha/year

STOCK: Groynes_lenght(t) = Groynes_lenght(t - dt) + (Construction__rate -
Deteroriation__time) * dt
meter=meter+(meter/year-meter/year)*year
meter=meter+meter
meter=meter
INIT Groynes_lenght = 0 meter
INFLOWS:
Construction__rate = If time < Activation_policy_hard_infrastructure_Year_20 then 0 else
((Gap_lenght_required/Construction_time))
meter/year=meter/year
OUTFLOWS:
Deteroriation__time = If time < Activation_policy_hard_infrastructure_Year_20 then 0 else
Groynes_lenght/50
meter/year=meter/year

STOCK: Mangrove_belt(t) = Mangrove_belt(t - dt) + (Maturation__rate -
Acuaculture__expansion - Erorsion_rate) * dt
ha=ha+(ha/year-ha/year-ha/year)*year
ha=ha+ha
ha=ha
INIT Mangrove_belt = 100 ha
INFLOWS:
Maturation__rate = (Area_under_restoration/Maturation_time)*(1-
Probability__of_restoration__failure)
ha/year=(ha/year)*(1-dimensionless)
ha/year=ha/year
OUTFLOWS:
Acuaculture__expansion = Planned__expansion_area/Time__expansion
ha/year=ha/year
Erorsion_rate =
(Mangrove_belt/Erosion_time)*Effect_of_cross_shore_transport_process_on_erosion
ha/year=ha/year*dimensionless

Activation_policy_hard_infrastructure_Year_20 = 20 year
Activation_policy_restoration_Year_20 = 20 year

Area__protected = 50 ha
Condition_for_payment = if time >Activation_policy_hard_infrastructure_Year_20 and Mangrove_belt >= Restoration__objective then 1 else 0
dimensionless=dimensionless
Condition_for_payment_2 = if time >Activation_policy_hard_infrastructure_Year_20 and Erorsion_rate = 0 then 1 else 0
dimensionless=dimensionless
Condition_for_payment_3 = if time >Activation_policy_hard_infrastructure_Year_20 and Mangrove_belt >= Restoration__objective then 1 else 0
dimensionless=dimensionless
Construction_cost = Groyne__Cost_per_m*Construction__rate
dollars/year = (dollars/meter)*(meter/year)
dollars/year=dollars/year
Construction_cost_1 = Groyne__Cost_per_m*Construction__rate
USDollars/year = (USDollar/meter)*(meter/year)
USDollars/year=USDollar/year
Construction_cost_2 = Groyne__Cost_per_m_1*Construction__rate
dollars/year = (dollars/meter)*(meter/year)
dollars/year=dollars/year
Construction_time = 0.5 year
Cross_shore = Normal_cross_shore*Effect_of_mangrove_on__cross_shore
meters = meters*dimensionless
meters=meters
Desired_reduction__of_Long_shore = Normal_Long__shore-Cross_shore
meters=meters-meters
meters=meters
Deteroriation_time = 7 year
Efect_of_disturbance__regulation_on__value_per_hectare = GRAPH(Ratio_actual_mangrove__over_optimal_for__disturbance_regulation)
(0.00, 0.102), (0.1, 0.119), (0.2, 0.156), (0.3, 0.25), (0.4, 0.463), (0.5, 0.611), (0.6, 0.783), (0.7, 0.906), (0.8, 0.955), (0.9, 0.984), (1.00, 1.00)
dimensionless=dimensionless
Effect_of_cross_shore_transport_process_on_erosion = GRAPH(Ratio_cross_shore_over_long_shore)
(0.00, 1.00), (0.1, 1.00), (0.2, 0.891), (0.3, 0.786), (0.4, 0.62), (0.5, 0.451), (0.6, 0.282), (0.7, 0.177), (0.8, 0.082), (0.9, 0.00), (1.00, 0.00)
dimensionless=dimensionless
Effect_of_mangrove_on__cross_shore = GRAPH(Mangrove_Ratio___for_erosion)
(0.00, 0.0115), (0.1, 0.0115), (0.2, 0.0728), (0.3, 0.222), (0.4, 0.441), (0.5, 0.598), (0.6, 0.732), (0.7, 0.862), (0.8, 0.935), (0.9, 0.989), (1.00, 1.00)
dimensionless= dimensionless
Erosion_time = 20 year
Failure_time = 2 year
Fraction_for__payment_aquaculture = 0.1
dimensionless/year=dimensionless/year
Fraction_for__payment_aquaculture_1 = 0.1
dimensionless/year=dimensionless/year
Fraction__for_payment_mangrove = 0.05
dimensionless/year=dimensionless/year
Fraction__for_payment_mangrove_1 = 0.05
dimensionless/year=dimensionless/year
Gap_lenght_required = Lenght__required-Groynes_lenght

meter=meter-meter
meter=meter
Gap__restoring = Restoration__objective-Mangrove_belt
ha=ha-ha
ha=ha
Government_subsidy_multiplier = 1 dimensionless
Government_subsidy_multiplier_1 = 1 dimensionless
Groyne__Cost_per_m = 3321USDollar/meter
Groyne__Cost_per_m_1 = 3321USDollar/meter
Lenght__required = Relation_lenght__groynes_ratio*Desired_reduction__of_Long_shore
meter = meter*meter/meter
meter = meter
Long_shore = Normal_Long__shore-Long__shore_reduction
meter = meter-meter
meter = meter
Long__shore_reduction = Groynes_lenght/Relation_lenght__groynes_ratio
meter=meter/(meter/meter)
meter=meter
Mangrove_Ratio___for_erosion =
Mangrove_belt/Optimal__Mangrove_for__hatling_erosion
dimensionless = ha/ha
dimensionless = dimensionless
Mangrove__value = 1619 USDollar
Maturation_time = 2 year
Net_present_value_Discount_rate = 0.1 dimensionless
Normal_cross_shore = 1 meter
Normal_Long__shore = 1 meter
Normal_value__aquaculture__hectare = 2642 year
Optimal_belt__for_aquaculture__disturbance_regulation = 50 ha
Optimal__Mangrove_for__hatling_erosion = 50 ha
Planned__expansion_area = if time <Activation_policy_restoration_Year_20 then
Mangrove_belt else Mangrove_belt-Area__protected
ha = then ha else ha-ha
ha = ha
Probability__of_restoration__failure =
Effect_of_cross_shore_transport_process_on_erosion
dimensionless
Ratio_actual_mangrove__over_optimal_for__disturbance_regulation =
Mangrove_belt/Optimal_belt__for_aquaculture__disturbance_regulation
dimensionless = ha/ha
dimensionless = dimensionless
Ratio_cross_shore_over_long_shore = Cross_shore/Long_shore
dimensionless = meter/meter
dimensionless = dimensionless
Reinvestment_in__acuaculture_time = 2 year
Relation_lenght__groynes_ratio = 25 meter/meter
Restoration_cost = Restoration__cost_per_hectare*Restoration__rate
USDollars/year = USDollars/ha*ha/year
USDollars/year=USDollars/year
Restoration_cost_1 = Restoration__cost_per_hectare_1*Restoration__rate
USDollars/year = USDollars/ha*ha/year
USDollars/year=USDollars/year

Restoration__cost_per_hectare = 225 USDollars/ha
Restoration__cost_per_hectare_1 = 225 USDollars/ha
Restoration__objective = 50 ha
Restoration__time = 2 year
Revenue_from__aquaculture =
Total_aquaculture__land_value*Fraction_for__payment_aquaculture
    USDollars/year = USDollars*dimensionless/year
    USDollars/year= USDollars/year
Revenue_from__aquaculture_1 =
Total_aquaculture__land_value*Fraction_for__payment_aquaculture
    USDollars/year = USDollars*dimensionless/year
    USDollars/year= USDollars/year
Revenue_from__aquaculture_2 =
Total_aquaculture__land_value*Fraction_for__payment_aquaculture_1
    USDollars/year = USDollars*dimensionless/year
    USDollars/year= USDollars/year
Revenue_from__Mangrove_use =
Total__mangrove__value*Fraction__for_payment_mangrove
    USDollars/year = USDollars*dimensionless/year
    USDollars/year= USDollars/year
Revenue_from__Mangrove_use_1 =
Total__mangrove__value*Fraction__for_payment_mangrove
    USDollars/year = USDollars*dimensionless/year
    USDollars/year= USDollars/year
Revenue_from__Mangrove_use_2 =
Total__mangrove__value*Fraction__for_payment_mangrove_1
    USDollars/year = USDollars*dimensionless/year
    USDollars/year= USDollars/year
star_time = 20 year
star_time_1 = 20 year
Time__expansion = 7 year
Total_aquaculture__land_value = Value_per__aquaculture_hectare*Aquaculture
    USDollar=USDollars/ha*ha
    USDollar=USDollars/ha
Total__mangrove__value = Mangrove_belt*Mangrove__value
    USDollar=USDollars/ha*ha
    USDollar=USDollars/ha
Value_per__aquaculture_hectare =
Normal_value__aquaculture__hectare*Efect_of_disturbance__regulation_on__value_per_h
ectare
    USDollars/ha=USDollars/ha*dimensionless
    USDollars/ha=USDollars/ha