

Home

General

Introduction

More and more, aquatic and semi-terrestrial vegetation (salt marshes, mangroves, floodplain vegetation) is playing a prominent role in interdisciplinary studies of recovering or threatened ecosystems and flood risk reduction. Both within Deltares and in the world around us, vegetation is a topic of interest for many different disciplines (hydrodynamics, morphology, (ground-)water quality, ecology and eco-engineering). Because vegetation modelling is a very interdisciplinary subject, it tends to fall between programmes or themes and people of different organizations may have difficulties to stay aware of the state-of-the-art. This wiki will help the vegetation modelling community (and other modellers) to integrate vegetation modelling tools, share knowledge and keep each other up-to-date on developments.

- On this wiki, you will find an overview of presently [available vegetation modelling tools](#) and their status as well as planned/suggested developments.
- There is a section on recent and ongoing [projects](#) in which vegetation modelling tools are used.
- There is also a [materials](#) section where you can find illustrations and presentations related to general vegetation modelling.
- To see who is doing what, there are pages on [people involved](#) internally and on [co-operation](#) with other institutes and companies.
- To keep each other up-to-date, there are sections on [activities](#) and [ideas](#) for developments, research and market actions.

Related Themes and Programmes

Themes and programmes that relate to vegetation modelling are:

Theme Ecosystems and Environmental Quality:

- Ecosystem Monitoring and Modelling (Nicky Villars, Joachim Rozemeijer)
- Nature Based Flood Defense (Bregje van Wesenbeeck, Ellis Penning)
- Understanding System Dynamics: from River Basin to Coastal Zone (Leonard Oste, Ad van der Spek)

Theme Flood Risk:

- Hydro- and morphodynamics during extreme events (Ap van Dongeren, Frederiek Sperna Weiland)

[Navigate space](#)

People

Developers and users of vegetation modelling tools, grouped per tool.

Delft3D Flow

Developers: Rob Uittenbogaard, Herman Kernkamp, Adri Mourits

Users: Jasper Dijkstra, Mijke van Oorschot, Bas Borsje

D-FM

Developers: Herman Kernkamp, Arthur van Dam, Adri Maurits

Users:

Delwaq

Macrophyte module: Ellis Penning, Valesca Harezlak, Jos van Gils, Rudy Scheuder

Vegmod: Johannes Smits

Interaction with morphology: Qinhua Ye, Bert Jagers

Habitat

Clara Chrzanowski, Valesca Harezlak, Marjolein Haasnoot, Mijke van Oorschot, Jasper Dijkstra

XBeach

Arnold van Rooijen, Ap van Dongeren, Joost den Bieman, Ellen Quataert

SWAN/SWASH

Menno Genseberger, Jacco Groeneweg (?), Tomohiro Suzuki (external)

Dynveg

Rob Uittenbogaard, Jasper Dijkstra, Niels Jacobsen

External co-operation

Research partners (model development and/or measurements):

Netherlands

Institute	Person(s)	Deltares contact	Topic(s)
NIOO-KNAW	Liesbeth Bakker	Ellis	
Delft University of Technology	Wim Uijttewaai, Andres Vargas Luna	Ellis, Jasper, Erik, Bregje, Bas B.	Flow resistance, mixing, forces, river meandering
Twente Univeristy	Erik Horstman		Flow and sediment transport in mangroves
NIOZ	Tjeerd Bouma	Bregje, Luca, Jasper	Landscape development, forces, trade-offs, patch interaction
University of Utrecht	Maarten Kleinhans, Hans Middelkoop	Erik, Mijke	River planform development, bank stability
UNESCO-IHE	Arthur Mynett, Ken Irvine, Alessandra Crosato		River meandering

International

Institute	Person(s)	Deltares contact	Topic(s)
University of Antwerp	Jonas Schoelynck, Patrick Meire, Stijn Temmerman, Kerst Buijs	Ellis, Jasper, Luca	Rivers and brooks, water quality, flow resistance, salt marsh development
University of Hannover	Maike Paul	Ellis, Jasper	Forces on real and surrogate plants under waves
University of Lyon	Sara Puijalon		Adaptation of plants to flow regime
Oxford University	Iris Moeller	Bregje	Stability and wave attenuation of salt marshes
University of Trento	?		Braided rivers, large wooden debris
National University of Singapore	SK Oong	Ellis, Jasper	In-stream wetlands
Queen Mary University of London	Angela Gurnell	Erik	Braided rivers, large wooden debris
IRSTEA	Deborah Slawson		?
ONR	?	Ap, Arnold	Wave damping over salt marshes

European projects

Name	Institutes	Deltares contace	Topic(s)
FAST	Oxford University (UK), GeoEcoMar (RO), Cadiz University (ES), NIOZ (NL)	Bregje, Mindert, Myra	Remote sensing + assessment of wave attenuation by wetlands

Hydralab IV, PISCES	U. Hull (UK), NTNU (NO), FZK (GER), CNRS (FR), U. Loughborough (UK), GeoEcoMar (RO)	Ellis, Jasper	Establish procedures for working with biota and surrogates in flumes and in the field; comparison of characteristics that influence flow
Building With Nature: Kennisvalorisatie Ecoshape (EU-EFRO subsidie)	Witteveen+Bos, Ecoshape, Deltares	Wouter, Hans G., Suzanne vd M	ao wave attenuation of Salix (field Experiments Dordrecht winter /spring 2015)

Tools

Model	Description	Status	Contact
Delft3D flow	1DV module – rigid plants affect flow and turbulence in 3D	Available, documented	Adri Mourits
Delft3D flow	Trachytope formula, 2D flow	Available, documented	Bert Jagers
D-FM	Trachytope formula, 2D flow	Available, not tested	Herman Kernkamp
D-FM	1DV module – rigid plants affect flow and turbulence in 3D	Available not documented. Detailing of input required.	Herman Kernkamp
D-FM	dynamic vegetation development via Python	Under development	Peter Herman, Arthur van Dam
SWAN-VEG	Additional effect of vegetation in formula, based on work of Suzuki	Available, documented	Jacco Groeneweg
XBeach	Short and long wave attenuation by rigid vegetation (e.g. mangroves)	Available, documented	Arnold van Rooijen
Delwaq	SAV; Macrophyte module with biomass development linked to nutrients, light etc.	Available, under development	Ellis Penning
Delwaq	Vegmod; Emergent vegetation development linked to nutrients; no flow feedback	Available, documented	Johannes Smits
Delwaq	Vegetation dynamics for flow without link to nutrients, dedicated for feedback to flow	Available, undocumented, special version?	Qinghua Ye
Delft3D-Part	Particle tracking; dispersal of seeds	Available, documented	Michelle Jeuken
Dynveg	Flexible vegetation – flow interactions. Via Matlab link with D3Dflow (patchwork)	Available, undocumented, not linked formally with standard Deltares software	Jasper Dijkstra
HABITAT	Potential habitat for various plants and animals via knowledge rules, static GIS overlay procedures	Available, documented	Clara Chzranowski
OpenFoam	?	Unknown	
SOBEK	?	Unclear if/how Sobek-users implement vegetation. Delwaq as a potential tool	
Matlab modules	Interaction of different vegetation types and life stages with hydromorphology (REFORM project)	Includes interactive coupling procedure with Delft3D-FLOW - undocumented	Mijke van Oorschot
Matlab modules	Interaction of flexible vegetation with flow (and sediment)	Unofficial, undocumented	Jasper Dijkstra

Projects

Overview of the most prominent related current/near-future EU- and Market projects related to vegetation:

Discipline	Project name	Short description	Contact person	Period	Tool (s) used	Material
Ecology /morphology	REFORM (FP7)	Establish instruments for evaluation of the effect of landscaping measures for flood protection and ecological restoration	Mijke van Oorschot	2012-2016		
Ecology/flood risk	B-Safe (NWO)	Probabilistic assessment of vegetation-enhanced flood risk reduction	Bas Borsje	2013-		
Ecology /hydrology	Instream Wetlands (PUB Singapore)	Filtration and beautification by wetlands in drainage channels	Ellis Penning	2013-2014	D3d-Flow, D-FM	Penning_INSTREAM WETLANDS IN SINGAPORE. pdf
Flood risk	FAST (FP7)	Quick scans of vegetation properties on floodplain scale, translation to risk reductions	Bregje van Wesenbeeck	2012-		
Ecology/Water quality	Adelaide Seagrass (SA Water)	Identification of nutrient load sources that hamper seagrass growth, to steer investments in load reductions	Jos van Gils	2013-2014	Habitat	

Ecology	Seagrass restoration Wadden Sea (RWS, Waddenvereniging)	Suitable habitat and seed dispersal trajectories determined focus of restoration efforts	Luca van Duren	2010-2013	D3d-Part, Habitat	
Ecohydraulics	Hydralab-PISCES	Linking field, flume and models of vegetated sites	Ellis Penning	2011-2014	Dynveg	

Ideas

Unable to render {include} The included page could not be found.

Materials

Capability statement

[Capability Statement on Vegetation Modelling Oct2014](#)

Presentations and posters

[Vegetation modelling Delft Software Days 2013 \(ppt; Dijkstra & Penning\)](#)

[Nisqually wetland development Delwaq \(poster; Ye & Jagers\)](#)

Publications

Flexible vegetation, Dynveg: [Dijkstra & Uittenbogaard 2010](#)

Vegetation resistance, trachytopes, k-epsilon model, Delft3D: [Baptist et al. 2007](#)

Flow routing mangroves, Delft3D: [Horstman et al. 2013](#)

Flow routing and sediment transport on salt marshes, Delft3D: [Temmerman et al. 2005](#)

Sediment transport, deltaic development, Delft3D: [Nardin & Edmonds 2014](#)

Pictures

Movies

Best Practices

This page contains descriptions of best practices or comparisons of modelling approaches from earlier projects, which may help to choose a modelling approach.

[Modelling tidal dynamics in mangroves](#) (by Erik Horstman, Twente University) contains a comparison between 3D (DPM) and 2DH (DPM, Baptist, Manning and non-vegetated) modelling of velocities, bed shear stress and sediment concentrations.

Activities & Agenda

Agenda (conferences, meetings etc.)

When	What	Who	Remarks
June 2015	IAHR Conference	Jasper	Sediment transport and underwater light climate affected by flexible aquatic vegetation
November 2014	Delft Software Days		
September 16, 2014	EE LunchLecture on modelling		

September, 2014	RiverFlow Conference, Swiss	Lora Buckman	present experimental work on forces on plants
-----------------	-----------------------------	--------------	---

Activities (developments, proposals, etc.)

Start	Stop	What	Who	Remarks
feb 2016	2017-2018	Vegetation modelling for spearhead NBFD: incorporate dynamic vegetation in DFM and set-up community	Peter H., Jasper, Arthur, Herman	external parties: UUtrecht, UAntwerpen
aug 2014	July 2015	Model long-term salt marsh/mangrove development + wave attenuation (XBeach)	Bregje, Jasper, Karel, Arnold	co-operation with The Water Institute
sept 2014	Apr 2015	Validate Dynveg for waves	Rob, Joost Dobken (TUD), Wout Bakker (TUD)	Incl. experimental work in flume TUD, video of vegetation motion
dec 2013	2015	Incorporating wave attenuation by stiff emergent vegetation in XBeach	Arnold	
07-05-2014	?	Set up wiki	Jasper	

Recently updated

Recently Updated

Materials

10-07-2019 • updated by [Herman Kernkamp](#) • [view change](#)

[Vegetation modelling tools](#)

20-12-2017 • updated by [Michelle Jeuken](#) • [view change](#)

[Vegetation modelling tools](#)

16-01-2017 • updated by [Jasper Dijkstra](#) • [view change](#)

[Home](#)

16-01-2017 • updated by [Jasper Dijkstra](#) • [view change](#)

[The vegetation modelling community](#)

16-01-2017 • updated by [Jasper Dijkstra](#) • [view change](#)

[XBeach-VEG](#)

14-10-2015 • updated by [Arnold van Rooijen](#) • [view change](#)

[Vegetation modelling tools](#)

14-10-2015 • updated by [Arnold van Rooijen](#) • [view change](#)

[image2015-2-7 22:1:0.png](#)

07-02-2015 • attached by [Arnold van Rooijen](#)

[XBeach_Logo_New_Veg.png](#)

07-02-2015 • attached by [Arnold van Rooijen](#)

[image2015-2-7 21:52:49.png](#)

07-02-2015 • attached by [Arnold van Rooijen](#)

[image2015-2-7 21:52:24.png](#)

07-02-2015 • attached by [Arnold van Rooijen](#)

[image2015-2-7 21:49:28.png](#)

07-02-2015 • attached by [Arnold van Rooijen](#)

[image2015-2-7 21:46:16.png](#)

07-02-2015 • attached by [Arnold van Rooijen](#)

[image2015-2-7 21:45:35.png](#)

07-02-2015 • attached by [Arnold van Rooijen](#)

[image2015-2-7 21:44:57.png](#)

07-02-2015 • attached by [Arnold van Rooijen](#)