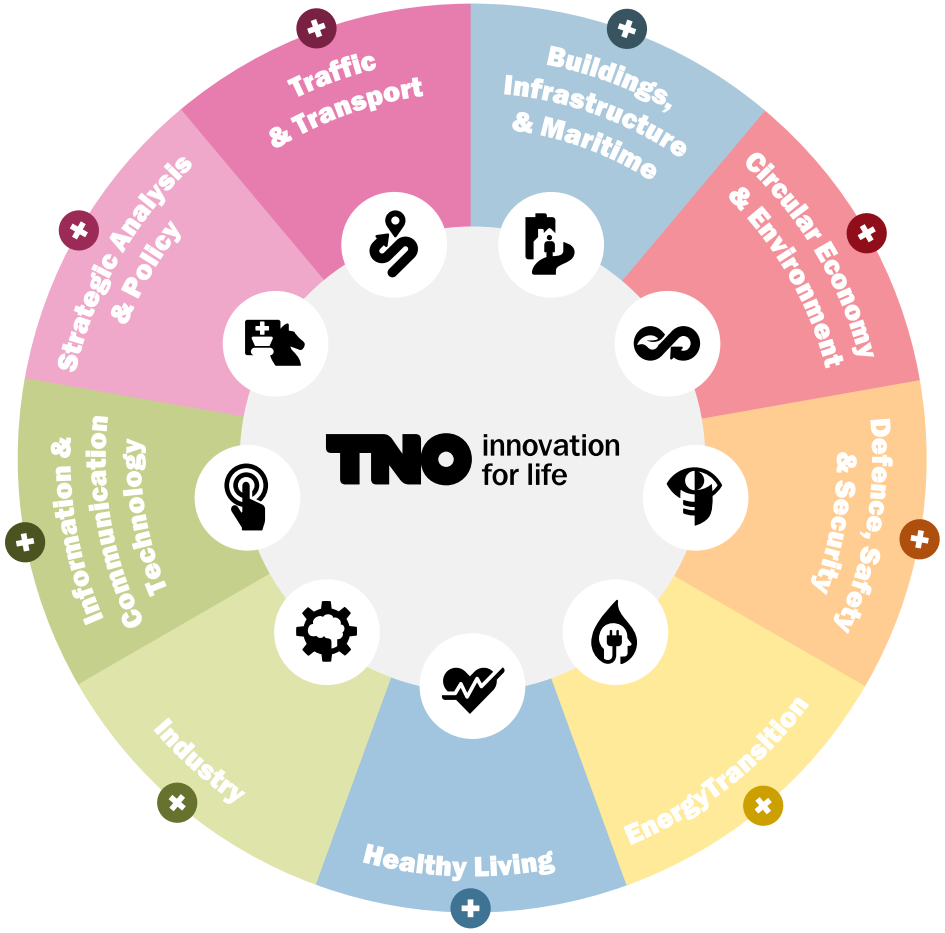
TNO innovation for life

CHALLENGES OF CONVERTING SEAWEED TO PAINT AND DRESSES

SIG SEAWEED 7 CONFERENCE | DR. J.W. VAN HAL

TNO
WHO WE ARE?



Zcore: Seaweed Residues for Superior Bio-Coatings

The ZCORE project is made possible by the European Regional Development Fund and the provinces of Noord-Brabant, Zeeland, and Limburg in the context of OPZuid.

European Union

European Regional Development Fund

OPZuid
European Innovation Programme South Netherlands

Provincie Zeeland

Provincie Noord-Brabant

provincie limburg

The profitable way to bio-aromatics

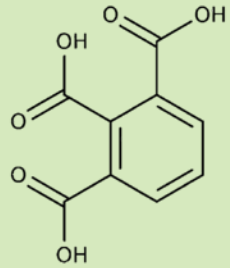
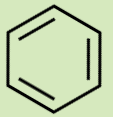
Biorizon

Biomass residues & recycle streams

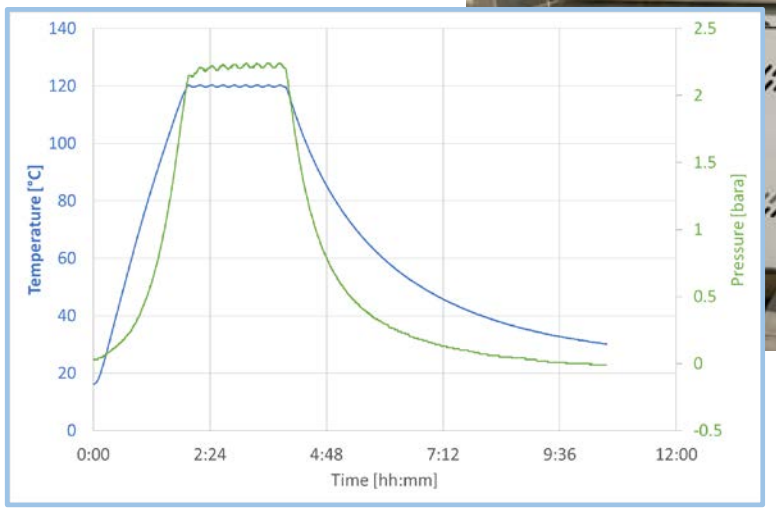
Effective conversion to biobased aromatics

Highly functional, renewable building blocks

How we make bio-aromatics

Horizons	Feedstock	Conversion Technology	Bio-Aromatics	Applications
Sugar to Bio-Aromatics	 C5 Sugars/ Furfural	Diels-Alder	 Specialty €€€	       
Lignin to Bio-Aromatics	 Lignin	Catalytic Depolymerization		
Thermochemical Conversion of Biomass to Bio-Aromatics	  Biomass residues & Recycle streams	Pyrolysis Gasification	 Bulk €	

Seaweed biorefinery: Extraction - Batch reactor



- 30 kg dry seaweed (10 kg/batch)
- 90 liters demineralized water / batch
- 120°C
- 2 hours

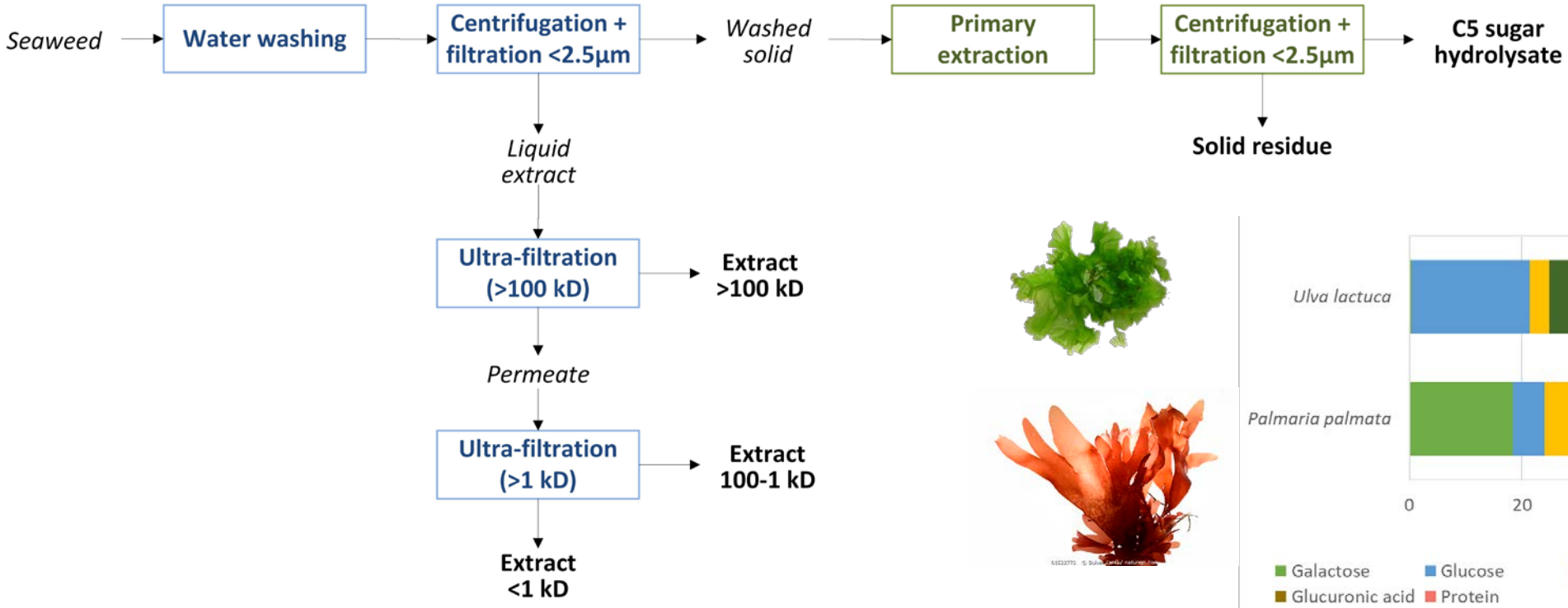
- Release sugars in oligomeric form
- 22 g/kg Xylose

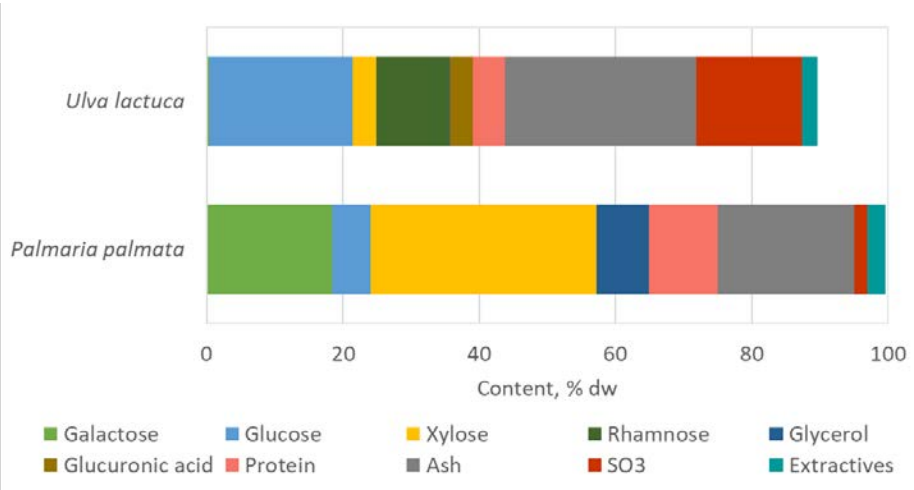
Seaweed biorefinery: Extraction - Batch reactor

+ water washing: maximize recovery of sugars

Seaweed biorefinery: Challenges & mitigations

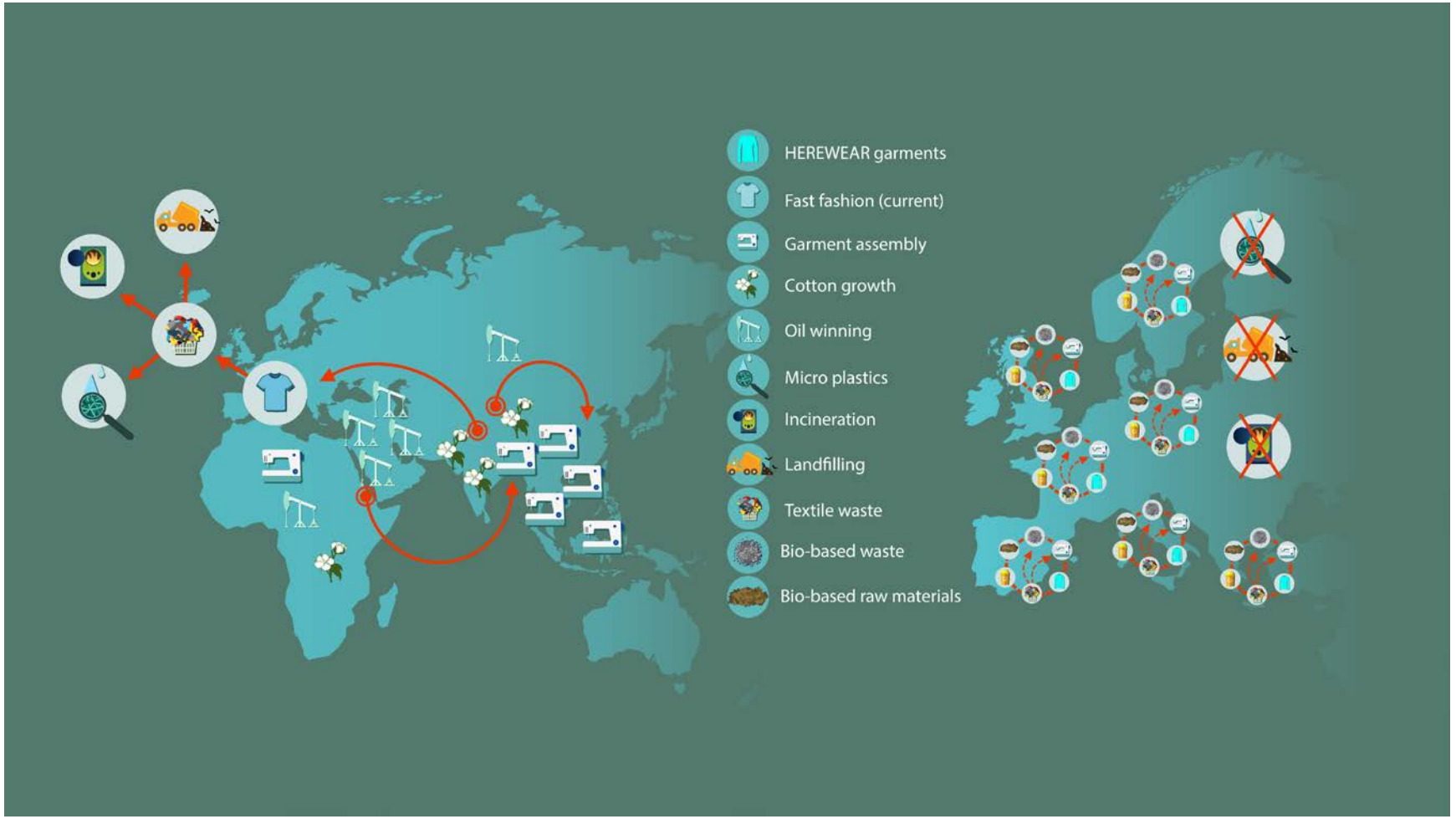
- High acid requirements due to buffering capacity of seaweed
- Pre-washing as aid: Valorisation of side streams from washing, e.g. recovery of polysaccharides & minerals
- Other organics downstream: Tailoring downstream conditioning to further (biochemical/catalytic) processes



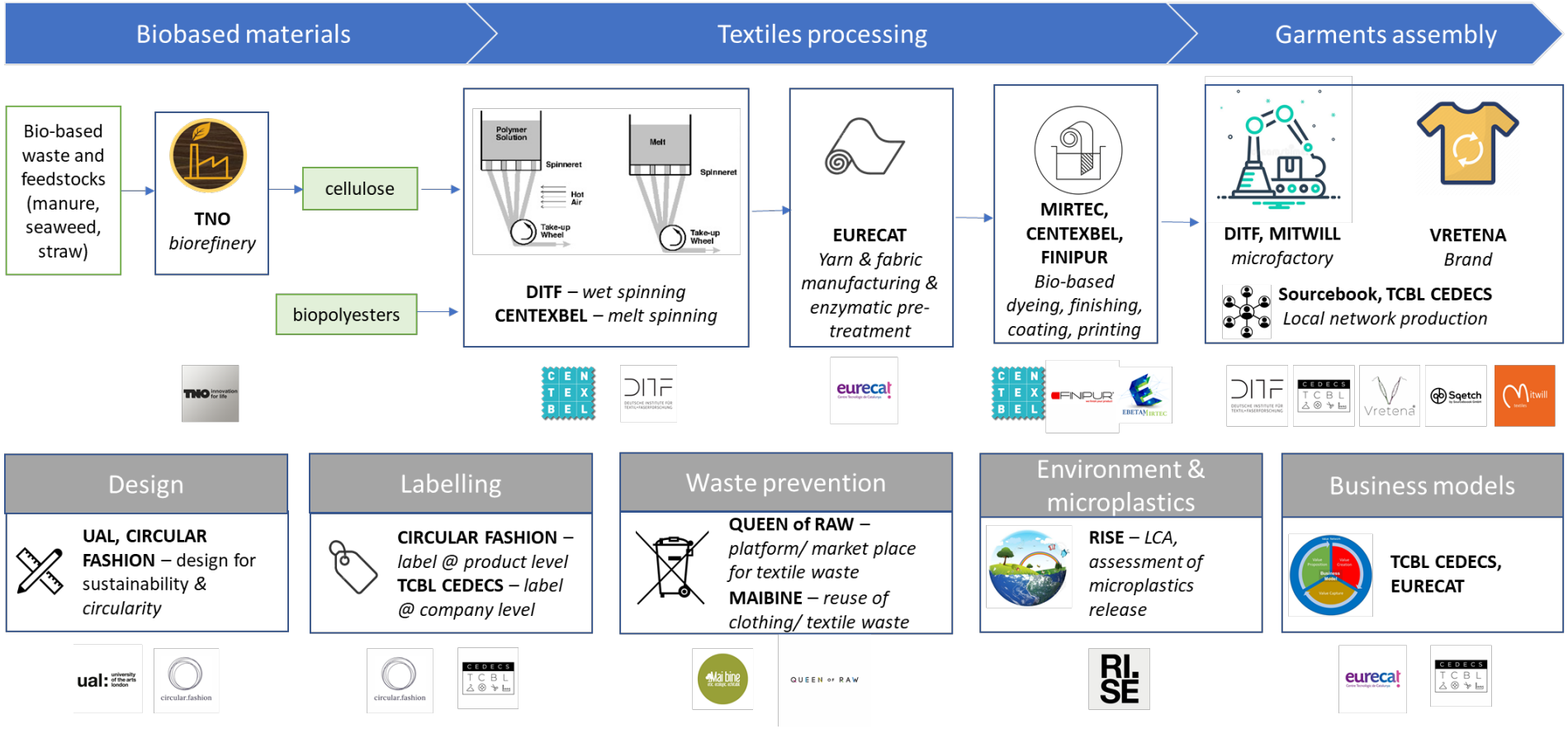



Biorizon
3-Methyl
Phthalic
Anhydride
Biorizon
Hemimellitic
Acid
Biorizon
3,6-Dimethyl
Phthalic
Anhydride
Biorizon
Oxa-Hexahydro-
Phthalic
Anhydride
Biorizon
Oxa-3-
Methylhexa-
Hydro Phthalic
Anhydride
Biorizon
Oxa-3,6-
Dimethylhexa-
Hydro Phthalic
Anhydride

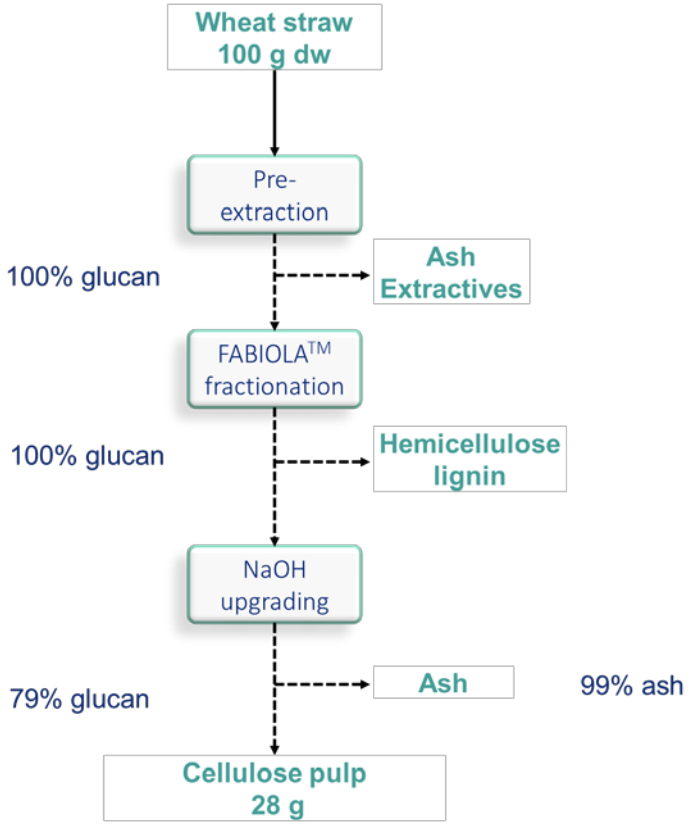
HEREWEAR GOAL:
Enabling Local, Circular & Bio-based Textiles



CONSORTIUM


Biobased materials
Textiles processing
Garments assembly
Bio-based waste and feedstocks (manure, seaweed, straw)
TNO
biorefinery
cellulose
biopolyesters
Polymer Solution
Spinneret
Hot Air
Take-up Wheel
Melt
Spinneret
Take-up Wheel
DITF – wet spinning
CENTEXBEL – melt spinning
EURECAT
Yarn & fabric manufacturing & enzymatic pre-treatment
MIRTEC, CENTEXBEL, FINIPUR
Bio-based dyeing, finishing, coating, printing
DITF, MITWILL
microfactory
VRETENA
Brand
Sourcebook, TCBL CEDECS
Local network production
Design
UAL, CIRCULAR FASHION – design for sustainability & circularity
Labelling
CIRCULAR FASHION – label @ product level
TCBL CEDECS – label @ company level
Waste prevention
QUEEN of RAW – platform/ market place for textile waste
MAIBINE – reuse of clothing/ textile waste
Environment & microplastics
RISE – LCA, assessment of microplastics release
Business models
TCBL CEDECS, EURECAT

Producing pulp from wheat straw



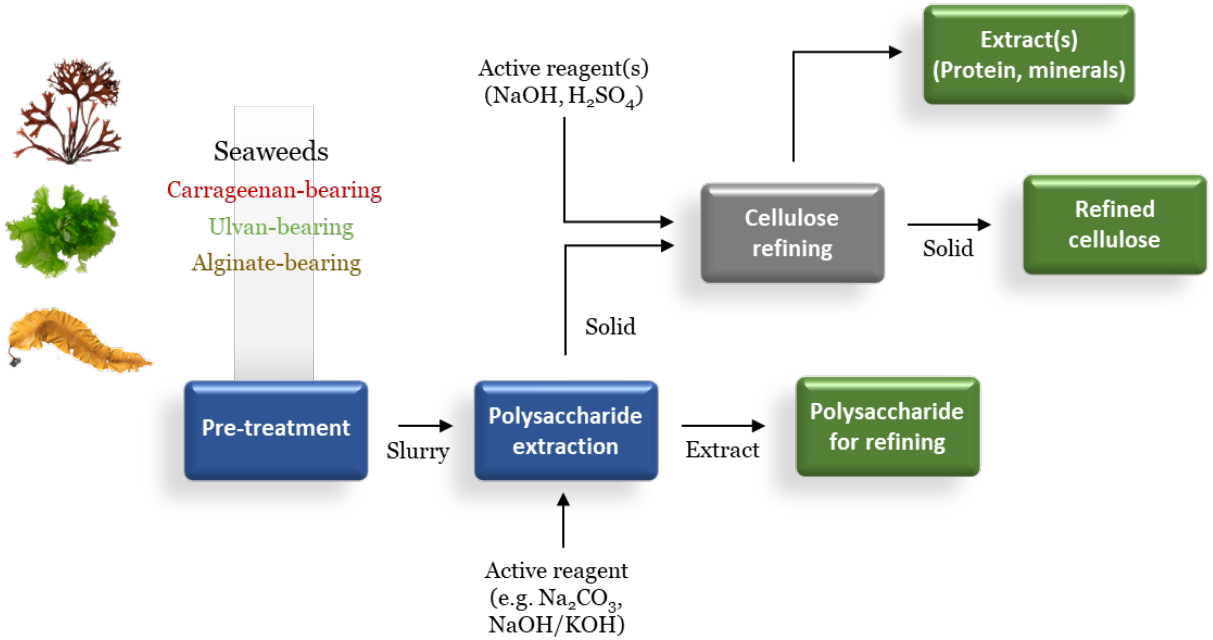
- Strong variation in biomass composition: type, season, location, etc.
- Pre-extraction, fractionation conditions and ash removal need to be optimized each agricultural residue

Producing textiles

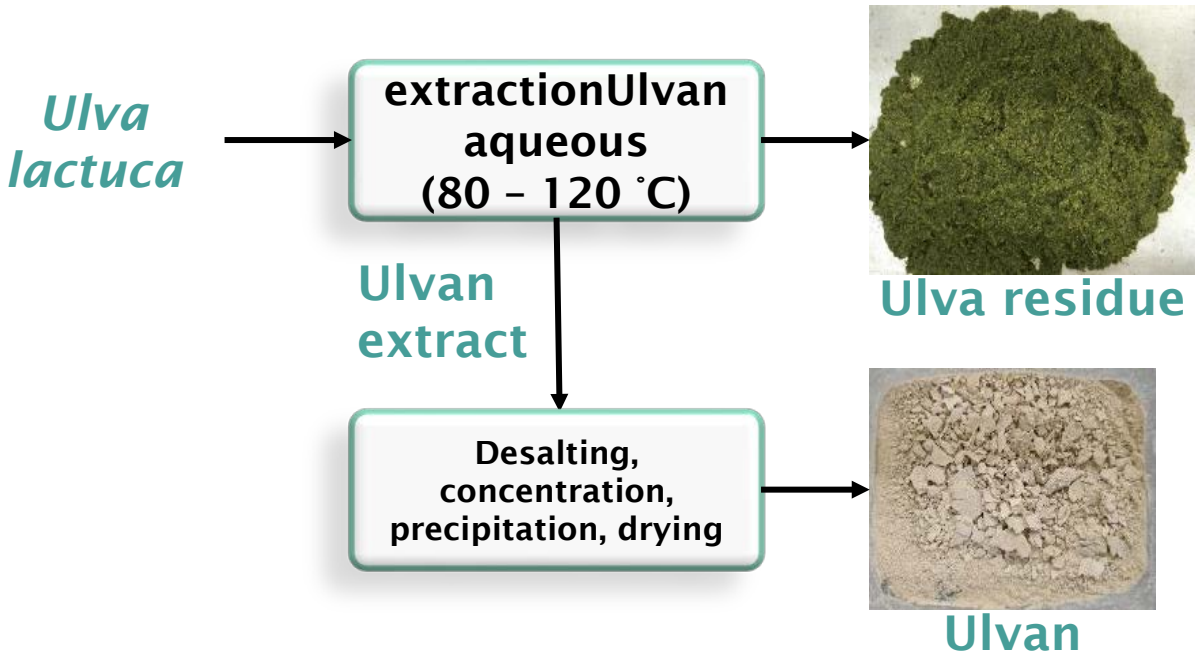
Cellulose from seaweed

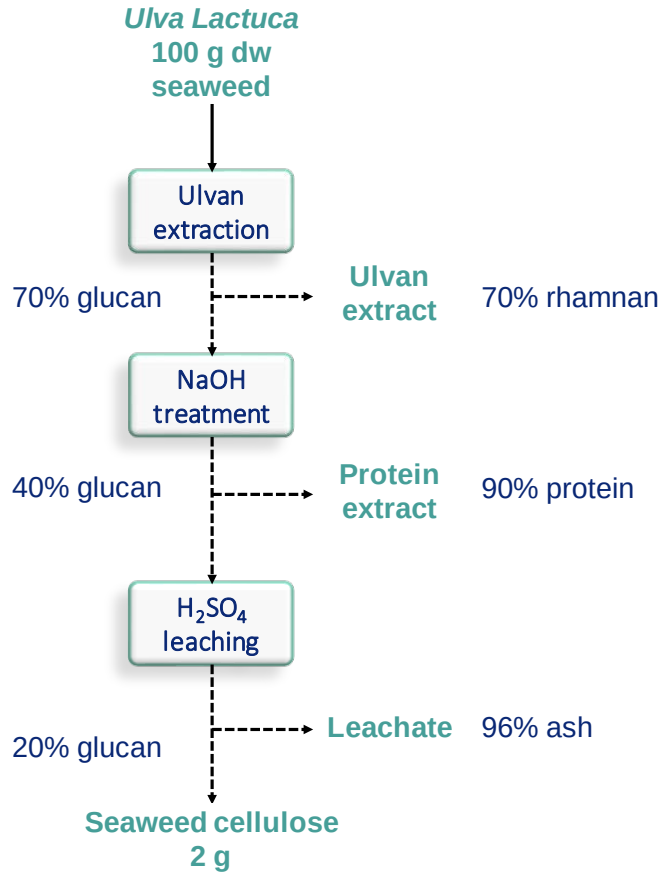
Producing cellulose from seaweed

- Hydrocolloid industry
- Large amounts of underutilized cellulose-rich residues
- Red, brown and green seaweeds
- Ulva residue contained most cellulose



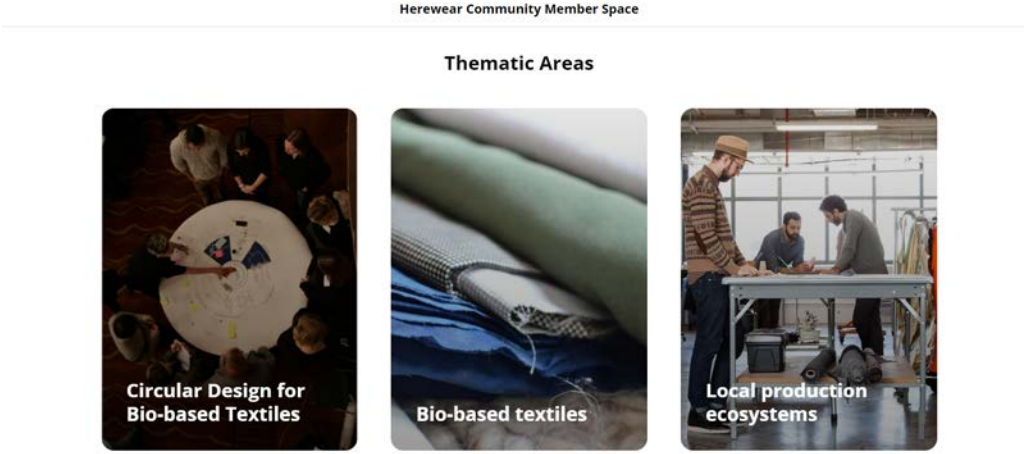
Not quite there yet





Herewear community

- Bring together like-minded actors over value chain
- Opportunities
  - Access to dedicated info
  - Contacts with broad network
  - Get involved in project activities
  - Direct access to platforms of Herewear partners



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