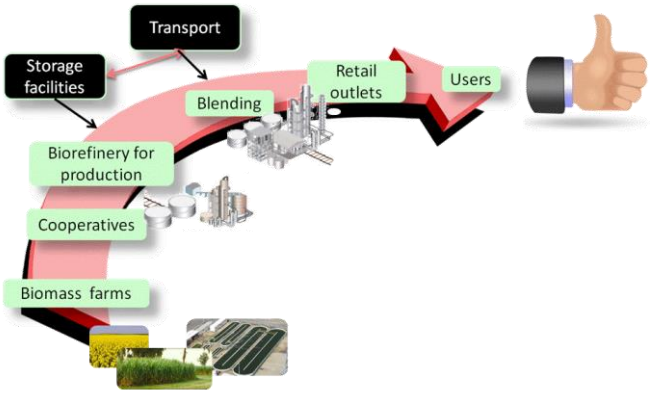
Capacity building to create sustainable non-food supply chains for biofuels and green chemicals of the future



Project Title:	Capacity Building in South Africa, Namibia and Ghana to Create Sustainable, Bio-oil Supply Chains
Lead	University of Greenwich
Partners	Turner & Townsend (Pty) Ltd, South Africa University of Namibia, Namibia University of Ghana, Ghana Jatropha Africa Ltd, Ghana Goldex 35 (Pty) Ltd, South Africa Consorzio di Ricerca per lo Sviluppo di Sistemi Innovativi Agroambientali (CoRiSSIA), Italy Marine Biological Association, United Kingdom

Course Specification

Course Title	**Algae-based waste water treatment systems**
In-country Course Coordinator	
Academic Level	Continuing Professional Development
Credit rating (if any)	
Pre-requisites	BSc degree biology, chemistry or wastewater process engineering

Introduction and Rationale

Aims

The main aims of the course are to develop the practical and written skills required to recognise the application of algae in wastewater management, to isolate and cultivate algae for wastewater treatment and to consider their potential use in the context of algal biorefineries.

Learning Outcomes

On completing this course successfully you will be able to:

- Explain the contribution of algae in wastewater treatment processes and describe the role of bacteria and other micro organisms in wastewater treatment
- Describe algal wastewater process requirements
- Demonstrate how to obtain a profile of wastewater with respect to the main environmental parameters relevant for supporting algal growth (phosphate, nitrate, COD, O2 profile, pH value)
- Describe the practical requirements needed to sample algae in the field
- Demonstrate how to isolate and cultivate algae with potential for wastewater treatment

- Discuss the opportunities for processing wastewater in the context of biotechnology and algal biorefineries

Indicative Content

A 1 day workshop with on-line training materials to support theoretical training covering the following:

1. Introduction to the use of algae in wastewater treatment processes
2. Wastewater chemistry
3. Practical aspects of sampling, isolating and cultivating algae from the field
4. Algal identification for practical applications
5. The ecology, growth kinetics and population dynamics of algae used in wastewater treatment processes
6. Metabolic activities and nutrient requirements of wastewater algae
7. Role of bacteria and other microorganisms in wastewater treatment and their interaction and impact on algal physiology
8. Algal wastewater processing in a biorefinery: techno-economic and environmental impacts

Learning and Teaching Activities

Learning and teaching activities centred on

- guided reading
- practical techniques aimed at
    - sampling algae from the field;
    - analysing wastewater;
    - isolating and cultivating microalgae
    - discriminating pathogens
- lectures and a field visit to two different wastewater treatment facilities

The learning and teaching activities are designed to be progressive and promote independent, supported learning linked to field-based practical activities associated with wastewater analysis and assessment for algal treatment processes and application in the algal biorefineries of the future

The activities include: practice-based work; web-based research and literature searches; and group activities in tutorial sessions. The activities are both formative and summative with feedback representing an important element to develop and improve student learning. Feedback via formative and summative activities is an important part of student learning.

The knowledge and understanding outcomes are acquired from practical field work and analysis supported by directed reading, discussions, and web-based resources. Students work independently with the teaching materials and are encouraged in group work to develop and challenge their ideas.

Cognitive skills are promoted in the teaching materials via a range of activities including self-assessment and practice-based work. Students are encouraged to use each other for support and engage in critical discussion and reflection. Feedback aids the development of cognitive outcomes

Practical and professional skills and generic skills are promoted throughout the course and are integral to, and embedded within the activities.

Learning Time (1 credit = 10 hours)

Scheduled contact hours:	**Supervised practical sessions in a workshop**	**~12 h**
	Tutorials in a workshop	**~6 h**
Guided independent study	Guided independent study	**~10 h**
	Independent field work	**~2h**
Total hours ('Should be equal to credit x 10')		**~30**

Assessment Details: (to be completed):

Methods of Assessment				
Grading Mode				
Weighting %				
Pass Mark				
Word Length				

Indicative Course Materials and Reading (to be completed):

ISBN Number (for printed material)	Author	Date	Title	Publisher