

Achieving Common Information Structures for Comprehensive Quantitative Analyses

For the UN, Governments, Industry and the Capital Markets



RESOURCE MANAGEMENT WEEK 2021

ENABLING SUSTAINABILITY PRINCIPLES IN RESOURCE MANAGEMENT



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Bringing the UNFC 'Adoption to Life'



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- To-date, UNFC has been adopted mainly for **disclosure & reporting**
- UNFC is also to **compare & contrast across resource types:**
 - Policies } Impact on {
 - Portfolios } {
 - Projects } {
 - People
 - Planet
 - Prosperity
- To demonstrate this capability, a **Minimum Viable Tool** is built
 - Based on an established Resource Data Management System
 - Populated with realistic project data
 - Aimed for practitioners to use and improve
 - Supporting UNFC adoption and further gaps identification
 - For **well-informed decisions on sustainable resource management**

Roadmap to the Minimum Viable Tool



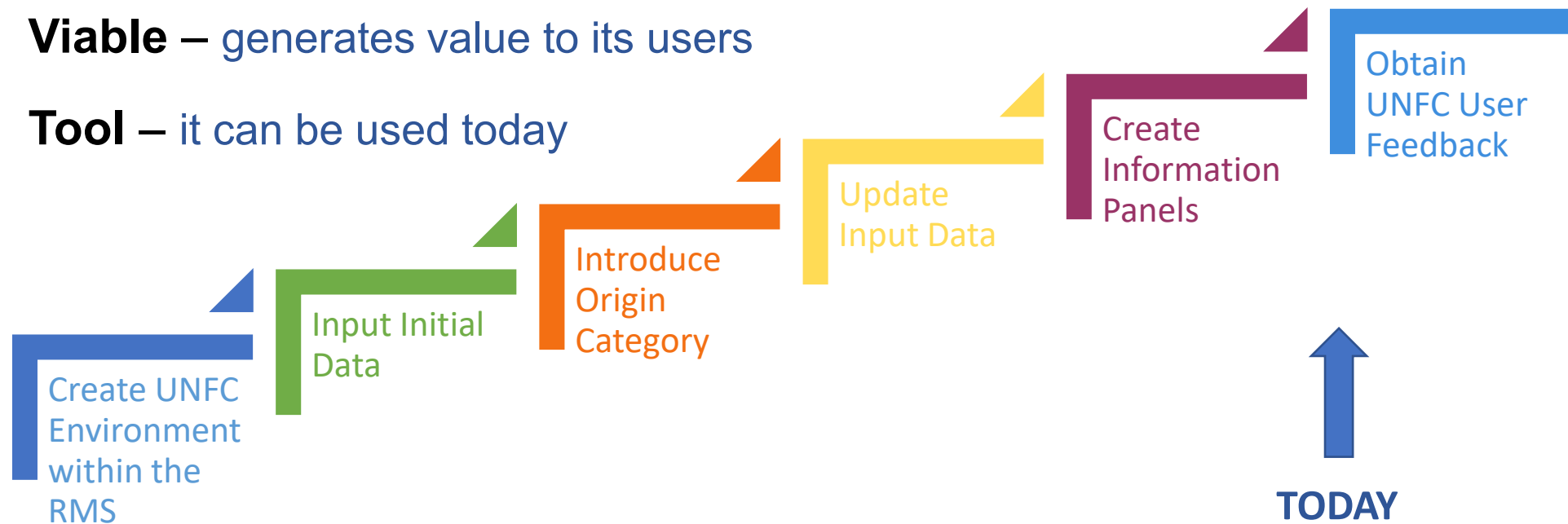
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Minimum –

- Starts with resources volumes/forecasts, cash flow, employment, CO2 intensity
- Extendable - for other socio-economic and environmental quantities or criteria
- Scalable – from projects to portfolios to policies

Viable – generates value to its users

Tool – it can be used today



Resource Categories – Flattened in 2D

Opening and Closing Balance of Resource Volumes



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HYDROCARBON RESOURCES [*10 ⁶ m ³]		CLOSING BALANCE														
		Np	111	112	113	221	222	223	321	322	323	334	341	342	343	344
		1,665	370	96	116	188	75	89	20	4	9	91	6,847	1,239	1,627	535
OPENING BALANCE	Np	1,641	1,641													
	111	402	25	351									26			
	112	99		94										5		
	113	152			113										39	
	221	96				96										
	222	24					24									
	223	48						48								
	321	20							18				2			
	322	5								4				1		
	323	9									8				1	
	334	69										49				20
	341	6,576					48						6,528			
	342	1,200						39						1,161		
	343	1,440							12						1,428	
344	338														338	
Revisions																
Transfers			19	2	4	44	12	28	2	0	1	35	291	72	159	177
Extensions & Discoveries												7				

Annually Reported Categories

EMPLOYMENT [FTE/year]		CLOSING BALANCE														
		Np	111	112	113	221	222	223	321	322	323	334	341	342	343	344
			2,908	756	915	1,098	287	603	156	33	73	715				
OPENING BALANCE	Np															
	111	3,158	194	2,760												
	112	777		737												
	113	1,193			886											
	221	754				754										
	222	189					189									
	223	379						379								
	321	157							141							
	322	38								30						
	323	74									66					
	334	539										382				
	341															
	342															
	343															
344																
Revisions																
Transfers			148	19	29	344	98	224	15	4	7	278				
Extensions & Discoveries												55				

Deteriorating

Maturing

Dashboard

Projects Overview & Details



FLUXBLE | Energy Energy Server

Venture

Search Add Venture

ADD FILTER

Select Continent/Country | ▾

Select Resource Type | ▾
HC, Solar, Wind, Geothermal, Hydro

Select Resource Classes | ▾
111, 112, 113

Select Resource Range | ▾
0.5 – 1.0 Exajoule

Select Social Measure | ▾
*Employment-Operational > 50,
Employment-Construction > 1,000*

COMPARE

Select Projects | ▾

PROJECT DETAILS

GLASS POINT MIRAAB SOLAR TO STEAM

Continent: Asia

Country: Oman

Resource Type: Solar

Lifecycle Duration [years]: 20

UNFC Resource Estimate – Project Units [MW]

111	112	113
1,050	250	500

Lifecycle Resource – 111 [Exajoule]: 0.66

Eqv. CO2 Emissions [g/MJ]: 13.9

Construction Duration [years]: 3.5

Employment-Construction [FTE]: 1,100

Employment-Operational [FTE]: 75

Financing Request [MM\$]: 90

Dashboard

Compare & Contrast Projects



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Venture

Search Add Venture

PROJECT COMPARISON

- Continent
- Country
- Resource Type
- Lifecycle Duration [years]
- UNFC Resource Estimate:
- Lifecycle Resource – 111 [EJ]
- Eqv. CO₂ Emissions [g/MJ]
- Construction Duration [years]
- Employment-Construction [FTE]
- Employment-Operational [FTE]
- Financing Request [MM\$]

MIRAAH SOLAR

Asia

Oman

Solar

30

[MW] 1,050

0.99

13.9

3.5

1,100

75

90

GREATER BARIK

Asia

Oman

Hydrocarbon

35

[MMSTB] 180

1.06

10.3

2.0

900

150

35

ATATÜRK DAM

Asia/Europe

Turkey

Hydro-Electric

50

[MW] 2,500

3.94

5.1

5.0

3,500

90

120

Dashboard

Solar to Hydrocarbon Comparison




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Venture

Search Add Venture



PROJECT COMPARISON

Continent

Country

Resource Type

Lifecycle Duration [years]

UNFC Resource Estimate:

Lifecycle Resource – 111 [EJ]

Eqv. CO₂ Emissions [g/MJ]

Construction Duration [years]

Employment-Construction [FTE]

Employment-Operational [FTE]

Financing Request [MM\$]

MIRAHAH SOLAR	MIRAHAH HC
Asia	Asia
Oman	Oman
Solar	Hydrocarbon
30	35
[MW] 1050	[MMSTB] 169
0.99	0.99
13.9	23.0
3.5	2.0
1,100	900
75	150
90	35

Based on reported saving of 300,000 tons of CO₂ emissions each year

Dashboard Forecasts

Testing Policies



Sensitivities on Example Project with No CO2-Tax, \$30/t, \$50/t, \$100/t CO2

FLUXBLE | Energy Energy Server

Economics Cases Scenarios

Cases Parameters Fiscal Terms

Search Project

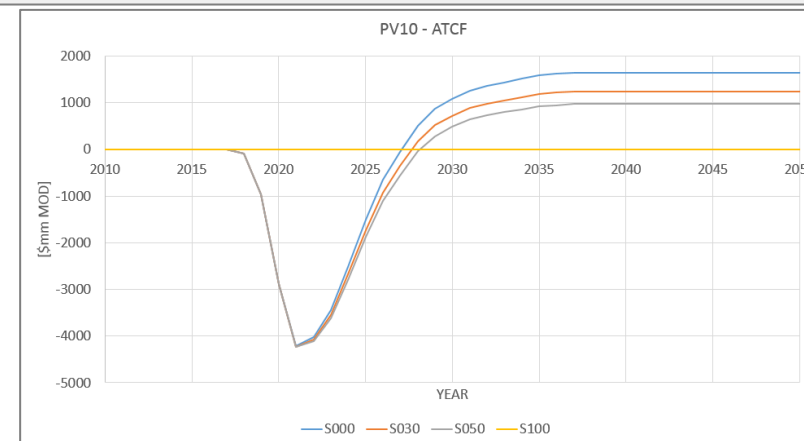
Key Metrics Upstream	NPV [\$mm, Net Share]		DPI 10%	IRR [%]	Total Production mboe	UTC [\$/boe RT]		Payout Time [MOD]	Max. Exposure [MOD, Net Share]	COP
	ATCF NPV0	ATCF NPV10				0%	10%			
Total Project S000_UC1	8469	1646	0.315	15.971	406	29.845	15.104	7.132	2335	2037,000
Total Project S030_UC1	7548	1239	0.237	14.619	406	31.920	15.903	7.355	2335	2037,000
Total Project S050_UC1	6934	968	0.185	13.671	406	33.304	16.437	7.518	2335	2037,000
Total Project S100_UC1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

UNFC 08 Mar 2021 - 5:44 AM

- S000_UC102A
- S030_UC102A
- S050_UC102A
- S100_UC102A

UNFC_UC102A_HC 08 Dec 2020 - 10:53 AM

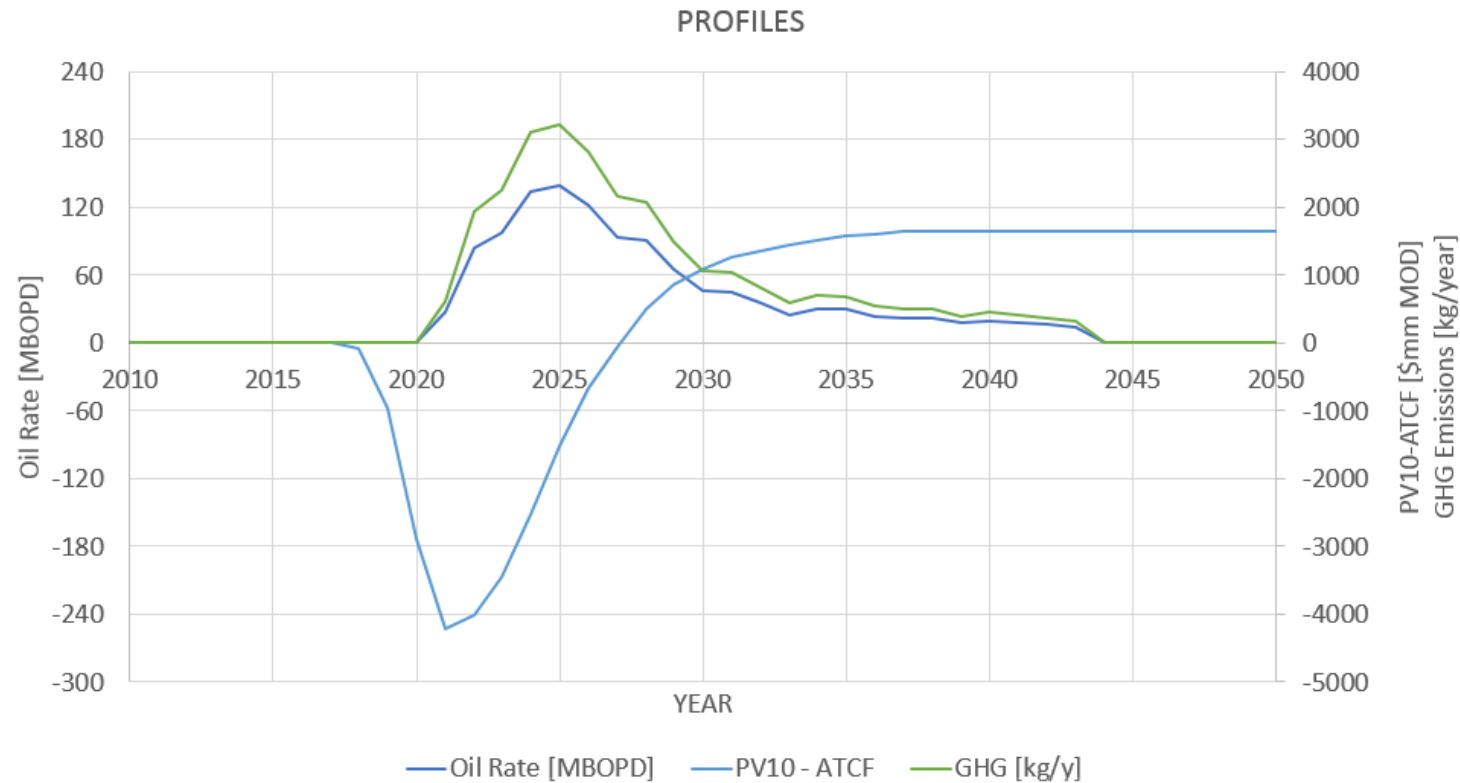
Example indicates project at \$100/t CO2 tax is impaired



Requirements for Testing Policies



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Requirements:

- Production profile for each resource category
- Cashflow profile for the project;
- GHG profile calculation in line with agreed sustainability reporting standard

Learnings from Early Adoption



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- 3D representation are illegible; **2D representation work well**
- **Reporting requirements** to cover production and (non-)sales volumes, revisions, transfers, discoveries and extensions
- **Single reporting standard set** needed for
 - Carbon intensity
 - Financial reporting
 - Local/in-country employment
 - Extensible to other quantities like anthropogenic, geothermal, CCUS
- **International Centers of Excellence**
 - For learning by doing
 - Sandbox for practitioners
- **Ready for Adopters with project/portfolio data**

Conclusion



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- **UNFC to compare & contrast projects across resource types:**
 - Policies
 - Portfolios
 - Projects
- Impact on
 - People
 - Planet
 - Prosperity
- **Scalable** – Projects, Assets, Entity, Jurisdiction, Trans-jurisdictional Entities
- **Minimum Viable Tools** exist to build trusted data systems
- **Double-Materiality assessments can become data-driven**, dynamic, and context-driven, using a wider scope of data
- **UNFC becomes a "negotiation" tool** for
 - “Balanced and integrated resource management“
 - Resolving conflict and
 - Create the win-win-win for People, Planet & Prosperity
- **Time to adopt the UNFC**
 - **For well-informed decisions on sustainable resource management**

Thank you!

And thanks to

[TARGET ENERGY SOLUTIONS LTD](#)

For providing the minimum viable tool

Matthias Hartung

Executive Consultant Data & Digital

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29 | 04 | 2021, Geneva



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Contributing Factors to Eqv. CO₂ Emissions



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Solar

- Source: <https://www.nrel.gov/docs/fy13osti/56487.pdf>
- **Study conducted by National Renewable Energy Laboratory (NREL)**
- Study aims to provide more precise estimates of life cycle GHG emissions from PV systems
- Contributing Factors to Eqv. CO₂ Emissions:
 - Mining and fabrication of PV Panels;
 - Mining and fabrication of power lines;
 - Mining and fabrication of panel reinforced foundation;
 - Logistics of material and construction staff;
 - Potential loss of vegetation that converts CO₂ to oxygen due to space occupation and shade creation.

Hydrocarbon

- Source: <https://www.osti.gov/pages/servlets/purl/1485127>
- **Study conducted by Stanford University**
- HC eqv. CO₂ emissions range between 3-20 g/MJ with a median of 10.3 g/MJ.
- Study focusses on the “well-to-wheels” life-cycle GHG emissions of transport fuels
- Contributing Factors to Eqv. CO₂ Emissions:
 - Mining and fabrication of concrete;
 - Mining and fabrication of steel;
 - Mining, fabrication & operation of heavy machinery;
 - Power generation requirement for operational usage;
 - Logistics of material and construction/operational staff;
 - Potential loss of vegetation that converts CO₂ to oxygen due to space occupation for access roads and facilities;
 - Impact on vegetation of potential spills;
 - Clean up efforts of potential spills.

Hydro-electric

- Source: <https://www.hydropower.org/greenhouse-gas-emissions>
- **Based on UNESCO G-res tool (life-cycle)**
- Contributing Factors to Eqv. CO₂ Emissions:
 - Mining and fabrication of concrete;
 - Mining and fabrication of reinforcement steel;
 - Mining, Fabrication & operation of heavy machinery;
 - Decay of submerged vegetation
 - Loss of vegetation that converts CO₂ to oxygen.

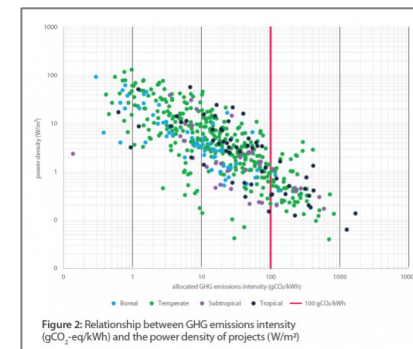


Figure 2: Relationship between GHG emissions intensity (gCO₂-eq/kWh) and the power density of projects (W/m²)