G-RES TOOL VALIDATION REPORT #3.102261

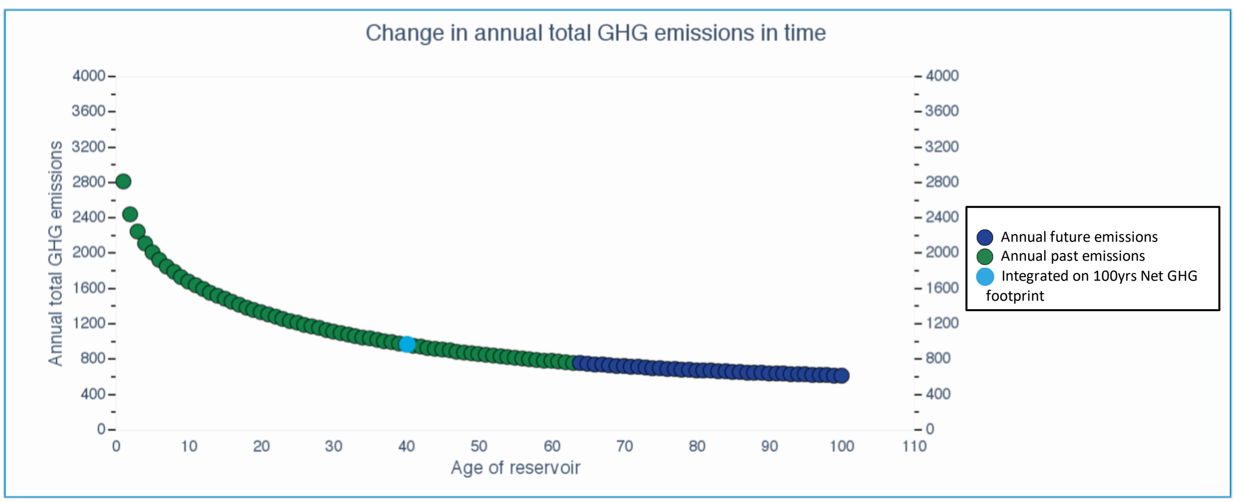
Weiss

The G-res tool is a web-based tool that allows hydropower companies, investors, consultants, decision-makers and other stakeholders to more accurately report on the net impact on GHG emissions resulting from the introduction of a reservoir in a landscape, whether for an existing or planned reservoir.

The G-res tool accounts for pre-impoundment GHG emissions, post-impoundment GHG emissions, unrelated anthropogenic sources (UAS) emissions, along with the temporal evolution of emissions over the lifetime (100yrs) of the reservoir, the emissions from the construction phase, and the allocation of GHG emissions to hydropower and any other services provided by the reservoir.

RESERVOIR CHARACTERISTICS AND RESULTS

G-res ID	Name	Climate	Reservoir Area (km^2)	Net GHG Footprint ($gCO_2e/m^2/yr$)	
				Integrated on 100 yrs	Integrated on specific period (2022-2058)
3.102261	Weiss	Subtropical	122.2	969 (882 - 1067)	662



*See G-res Tool pdf report for detailed input values and results.

Name of reservoir: **Weiss**

Landscape Information

Catchment Area (km^2)	**13660.45**	Phosphorus Community sewage in the catchment (kg P /yr)	
Population in the Catchment	**912915.6**	Community Wastewater Treatment	**None**
Catchment Annual Runoff (mm/yr)		Phosphorus Industrial sewage in the catchment (kg P /yr)	
		Industrial Wastewater Treatment	

	Land Cover in the Catchment Area				Pre-Impoundment Land Cover in the Reservoir Area					
			Land Use Intensity							
	%	km^2	Past	Current	%	km^2	% Mineral Soil	% Organic Soil	Land Use Intensity	% of Drained Organic
Croplands	**1.6 %**	**218.6**	**100**	**100**	**15.5 %**	**18.9**	**15.5 %**		**100**	
Bare Areas	**0.2 %**	**27.3**			**0.3 %**	**0.3**	**0.3 %**			
Wetlands	**0.7 %**	**95.6**								
Forest	**61.3 %**	**8373.9**			**40.0 %**	**48.9**	**40.0 %**			
Grassland/Shrubland	**19.6 %**	**2677.4**			**25.0 %**	**30.6**	**25.0 %**			
Permanent Snow/Ice										
Settlements	**14.7 %**	**2008.1**			**10.7 %**	**13.1**	**10.7 %**			
Water Bodies	**1.8 %**	**245.9**			**8.5 %**	**10.4**		**8.5 %**		
Drained Peatlands										
No Data	**0.1 %**	**13.7**			**0.0 %**			**0.0 %**		

Reservoir Information

Country	**United States**	River Length before Impoundment (m)	**83685.9**
Longitude of Dam (DD)	**-85.78**	Phosphorus Concentration (ug/L)	**90**
Latitude of Dam (DD)	**34.14**	Trophic Level	**Eutrophic**
Climate Zone (Reservoir Area)	**Subtropical**	Mean Global Horizontal Radiance ($kWh/m^2/d$)	**4.6**
Impoundment Year	**1958**	Mean Temperature per Month (°C)	
Reservoir Area (km^2)	**122.215**	January	**6.67**
Reservoir Volume (km^3)	**0.38**	February	**8.33**
Water Level (m above sea level)	**171.9**	March	**12.78**
Maximum Depth (m)	**18.9**	April	**16.67**
Mean Depth (m)	**3.109**	May	**21.11**
Littoral Area (%)	**58.434**	June	**25**
Thermocline Depth (m)		July	**26.67**
Water Intake Depth (m)	**3.048**	August	**26.67**
Secondary Water Intake Depth (m)		September	**23.33**
Soil Carbon Content (kgC/m^2)	**2.67**	October	**17.22**
Annual Wind Speed at 10 m (m/s)	**4.0**	November	**11.67**
Water Residence Time (WRT, yrs)	**0.0488**	December	**7.78**
Annual Discharge Main Intake (m^3/s)	**246.9**		
Annual Discharge Secondary Intake (m^3/s)		Mean Annual Air Temperature (C°)	**17.0**

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assessing ghg emissions from reservoirs

Reservoir GHG

PARTNERS: iha international hydropower association · UNESCO · UniTwin · UQÀM

Name of reservoir: **Weiss**

Net Predicted Annual CO_2e Emission

	Post-Impoundment	-	Pre-Impoundment	-	Unrelated Anthropogenic Sources	=	Net GHG Footprint	95% CI		
Emission Rate (tCO_2e/yr)	**93 596**	-	**-24 841**	-		=	**118 437**	**(107 843**	-	**130 379)**
of which CO_2	20 576	-	-25 095		n/a	=	45 671			
of which CH_4	73 020	-	254	-		=	72 766			
Emission Rate ($gCO_2e/m^2/yr$)	**766**	-	**-203**	-		=	**969**	**(882**	-	**1 067)**
of which CO_2	168	-	-205		n/a	=	374			
of which CH_4	597	-	2	-		=	595			

*Using GWP100 of 34 to obtain CH_4 emissions as CO_2e (IPCC 2013)

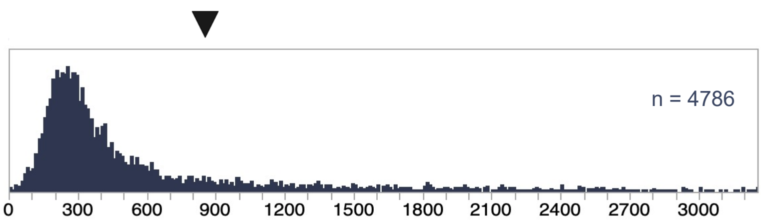
Unrelated Anthropogenic Sources

Potential amount of UAS as % of post-impoundment emissions 83 %

Weighted sum model risk result 200

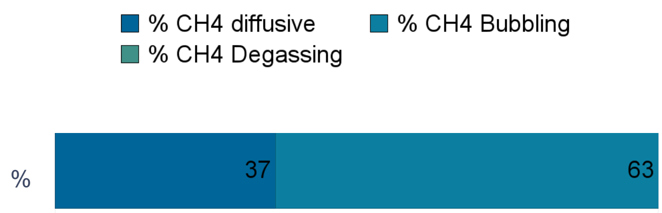
This reservoir compared to worldwide reservoirs

Net Reservoir Footprint ($gCO_2e/m^2/yr$) = 969



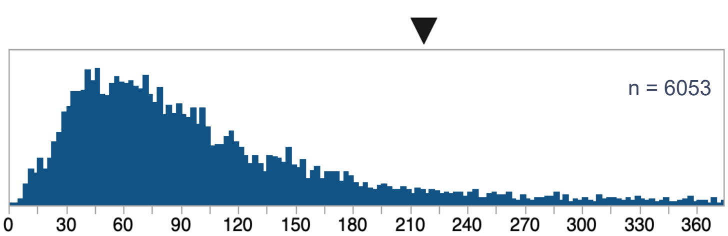
Detailed CH_4 Post-Impoundment Emissions

Relative contribution to CH_4 Post-Impoundment Emissions (%)

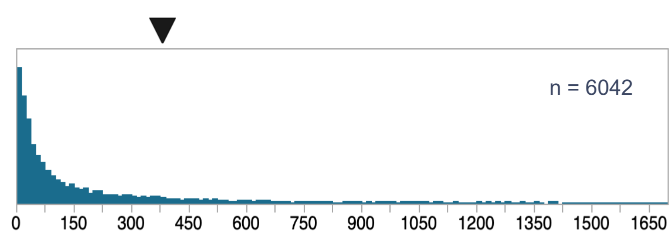


This reservoir CH_4 and CO_2 emissions compared to worldwide

CH_4 Diffusive Emissions ($gCO_2e/m^2/yr$) = 218



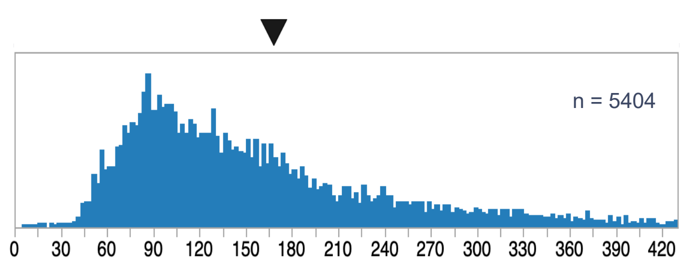
CH_4 Bubbling Emissions ($gCO_2e/m^2/yr$) = 379



CH_4 Degassing Emissions ($gCO_2e/m^2/yr$) =

Water Level or Thermocline not Define. Degassing Considered Zero.

CO_2 Diffusive Emissions ($gCO_2e/m^2/yr$) = 168



Name of reservoir: Weiss

Total GHG footprint information

	Post-Impoundment		Pre-Impoundment		Unrelated Anthropogenic Sources		Construction (Reservoir)		Net GHG Footprint	95% CI
Areal Emissions ($gCO_2e/m^2/yr$)	766	-	-203	-		+	n/a	=	969	(882 - 1 067)
Reservoir Wide Emissions (tCO_2e/yr)	93 596	-	-24 841	-		+	476	=	118 913	(108 319 - 130 855)
Total Lifetime Emission (tCO_2e)	9 359 586	-	-2 484 121	-		+	47 605	=	11 891 313	(10 831 852 - 13 085 496)

*Using GWP100 of 34 to obtain CH_4 emissions as CO_2e (IPCC 2013)

Allocation information

Net GHG Emissions Contribution for Each Reservoir Services

Reservoir Service	GHG Emissions from Reservoir (tCO_2e/yr)	GHG Emissions from Construction (tCO_2e/yr)	GHG Footprint (tCO_2e/yr)	Percentage Allocation (%)
Flood Control	0	0	0	0
Fisheries	0	0	0	0
Irrigation	0	0	0	0
Navigation	0	0	0	0
Environmental Flow	0	0	0	0
Recreation	0	0	0	0
Water Supply	0	0	0	0
Hydroelectricity	0	0	0	0

Hydroelectricity and Net GHG footprint

Power Density (W/m^2) =

Intalled Capacity (MW) =

Total Annual Generation (GWh/yr) =

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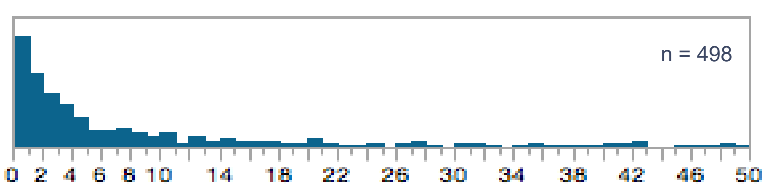
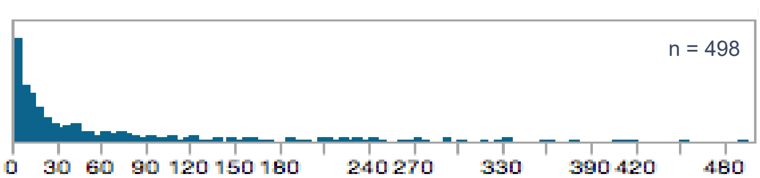


Allocated GHG emissions intensity (gCO_2e/kWh)= -



Allocation Method Used:

Emission Factor Used:

Default Emission Factors used

Construction Comments:

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Construction

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Name of reservoir: Weiss

Own Assessment

Emission output kgCO2e

Known Value for Construction	Total construction emissions				

Basic Assessment

Earth and Rockfill	Material excavated and/or used for construction	420505	m^3	km moved	9167009
Concrete	All concrete brought to site for the dam, tunnels, foundations	114683.	m^3	km delivery distance	38438301
Steel	All steel brougth to site for reinforcement, pipelines, mechanical and electrical		tonne	km delivery distance	0

More Detailed Assessment

Earthworks	Soft Excavation	m^3	km moved	0
	Rock Excavation	m^3	km moved	0
	Clearance and Removals	ha		0
Fill	Granular Fill	m^3	km delivery distance	0
	Rock Armour	m^3	km delivery distance	0
	Zoned Rockfill	m^3	km delivery distance	0
	Rock bolts	number	km delivery distance	0
Concrete Works	Formwork	m^2		0
	Facing Concrete	m^3	km delivery distance	0
	Mass Concrete	m^3	km delivery distance	0
	Reinforced Concrete	m^3	km delivery distance	0
	Shotcrete	m^2	km delivery distance	0
	Reinforcement	tonne	km delivery distance	0
Steelworks	Steel Penstocks	tonne	km delivery distance	0
	Steel Liner	tonne	km delivery distance	0
	Miscellaneous Steelwork	tonne	km delivery distance	0
Roads and Bridges	New Roads	km		0
	Refurbishment of Existing Roads	km		0
	PCC Vehicular Bridge Deck	m^2		0
Equipment	Power Generation	MW		0
	Power Connection	kV	km length	0