UNIVERSITÀ DI PISA

SecurDomino

Aspetti ambientali legati agli scenari di security in installazioni critiche

17/10/2024 – Carlo Grassi (NYX srl)

The **LIFE SECURDOMINO** project
has received funding from the European Union
under Grant Agreement **n° LIFE20 ENV/IT/000436**

SoW

- The research project will identify the possibility to implement mitigations and barriers to better assess and reduce the environmental impact described by international performance indicators.
- In particular, the project develops an innovative methodological approach to risk assessment that consider the reduction of the environmental impact and above all it proposes a numerical and software application to manage the risk scenarios by implementation of complex risk assessment procedure.

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LCA Modelling

The software applied for the environmental assessment

- Open LCA ver. 1.11
- Ecoinvent 3.8

- ✓ The software and database is used to build the model scenario and develop the environmental indicators assessment.
- ✓ The LCA model implemented with the OPEN LCA software will make it possible to develop scenario simulations to compare environmental performance

ecoinvent Database

As the world's most consistent and transparent life cycle inventory database, the ecoinvent database supports environmental assessments of products and processes worldwide.

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Major-accident/safety scenario definition

- The target of this activity is to develop an integrated approach that allows to simulate different major-accident scenarios and safety related ones to evaluate the environmental performance indicators and the performance of the mitigation measure implemented.
- As a preliminary case study, the release of diesel fuel from a storage tank is simulated and the key environmental indicators are evaluated by LCA approach.

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LCA Modelling

- The OPEN LCA software together with Ecoinvent database will be configured for the assessment of the environmental indicators by the modeling of the selected event/case studies.

INPUT

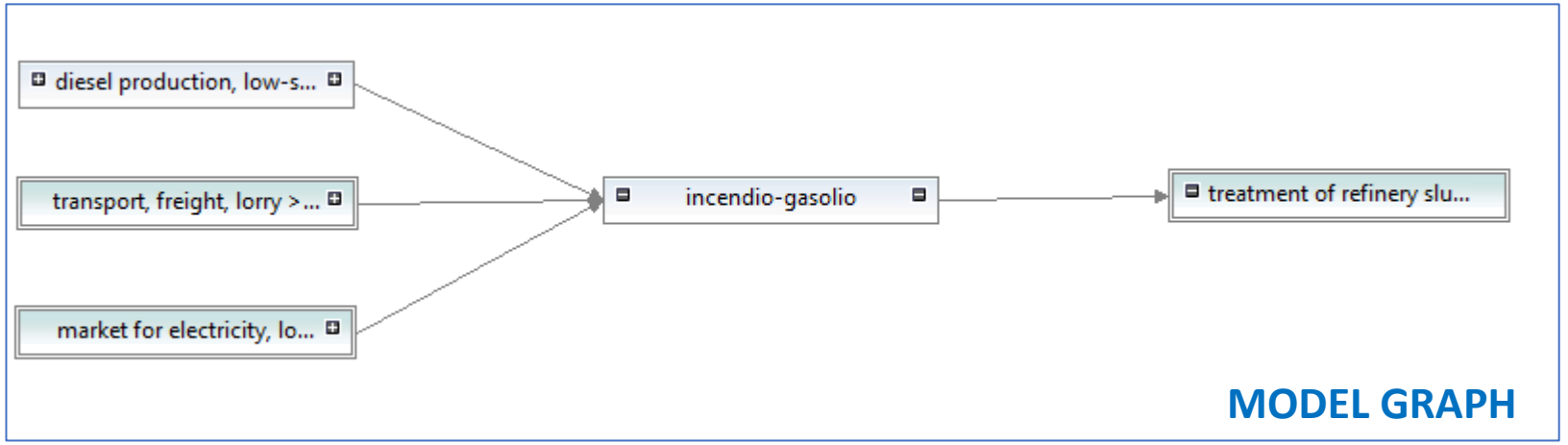
Inputs/Outputs: Incendio_gasolio

Inputs

Flow	Category	Amount	Unit	Costs/Revenues	Uncertainty	Avoided waste	Provider	Data quality e...	Description
diesel, low-sulfur	192:Manufacture of refined p...	835.00000	kg		none				
electricity, medium voltage	351:Electric power generatio...	15.00000	kWh		none				
transport, freight, sea, tanker for petro...	501:Sea and coastal water tr...	1.01035E6	kg*km		none				
Water, unspecified natural origin	Resource/unspecified	3.84000E4	dm3		none				

Outputs

Flow	Category	Amount	Unit	Costs/Revenues	Uncertainty	Avoided prod...	Provider	Data quality e...	Description
Carbon dioxide	Emission to air/high populati...	2670.00000	kg		none				
Carbon monoxide	Emission to air/high populati...	1.00000	kg		none				
Fly ash	Waste/unspecified	1.00000	kg		none				
Incendio_gasolio		**1.00000**	**m3**		**none**				
Nitrogen oxides	Emission to air/high populati...	0.02000	kg		none				
Oil waste	Waste/ecopoints 97, CH	250.00000	kg		none				
Particulates, < 10 um	Emission to air/high populati...	1.00000	kg		none				
refinery sludge	382:Waste treatment and dis...	3.84000E4	kg		none				
VOC, volatile organic compounds, uns...	Emission to air/high populati...	1.00000	kg		none				
Methane	Emission to air/high populati...	0.36000	kg		none				
fly ash and scrubber sludge	382:Waste treatment and dis...	1.00000	kg		none				



MODEL GRAPH

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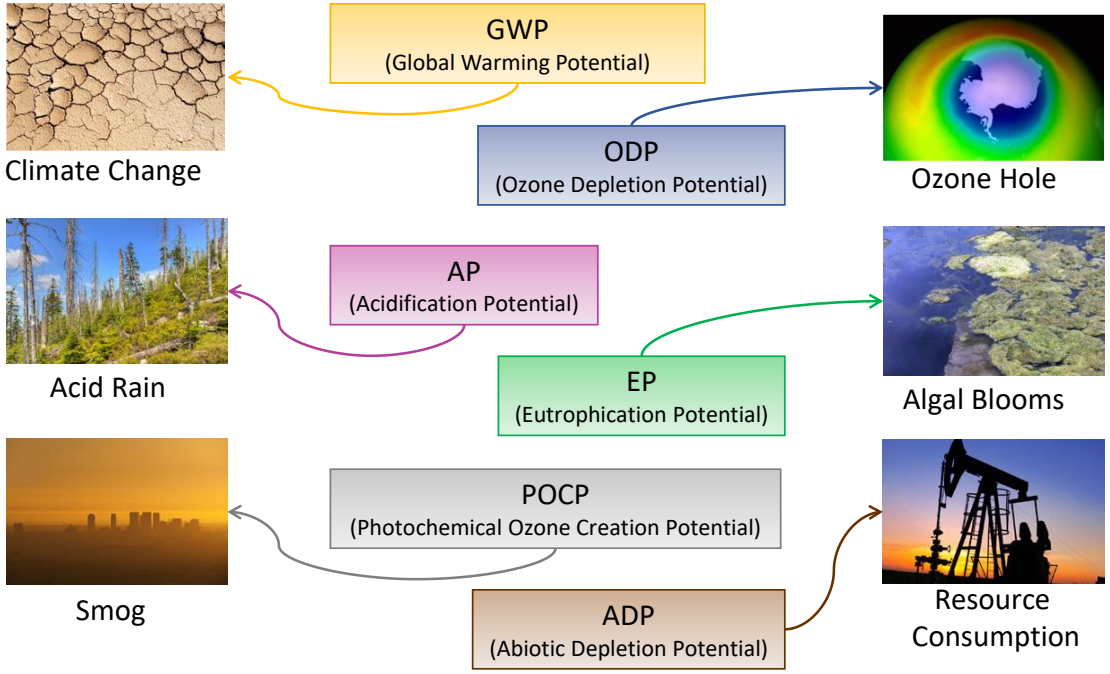
LCA Modelling

The implemented model will be configured to produce the estimation of the environmental indicator and to compare different scenario/situations.

Environmental Indicator

(an examples)



Environmental Indicators by OpenLCA

Abiotic depletion	3.27888E-6	kg Sb eq
Abiotic depletion (fossil fuels)	26.07087	MJ
Acidification	0.00469	kg SO2 eq
Eutrophication	0.00100	kg PO4--- eq
Fresh water aquatic ecotox.	0.52991	kg 1,4-DB eq
Global warming (GWP100a)	2.23350	kg CO2 eq
Human toxicity	1.10864	kg 1,4-DB eq
Marine aquatic ecotoxicity	605.39324	kg 1,4-DB eq
Ozone layer depletion (ODP)	3.23696E-7	kg CFC-11 eq
Photochemical oxidation	0.00019	kg C2H4 eq
Terrestrial ecotoxicity	0.00194	kg 1,4-DB eq

Define contributions of the process/accident elements

Global warming (GWP100a)			2.23350	kg CO2 eq
P market for electricity, low volta	3		0.10404	kg CO2 eq
P treatment of refinery sludge, h	3		2.12946	kg CO2 eq

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Follow up

- Simulate various scenario with implemented mitigation measures both safety/security and environmental ones. Evaluate the eventual benefits after the project implementation in the three DEMO sites.
- Compare the performances and identify the main evironmental indicator to be taken into account.
- Identify the main process contribution and define the possible upgrade in the mitigation measures.
- Extend the evaluations to the cases defined in the project and process the data

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THANK YOU!

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