

STEAM4Sustainability Hack

Team: SG2

Members: Karmo, Albert,
Markor, Loore, Helerin, Adeele



STEAM
BO.SS
boosting soft skills



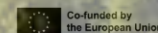
Floating sensor for Ocean Pollution Detection and Cleanup

SG2

Loore, Helerin, Adeele, Markor, Albert and Karmo

2025

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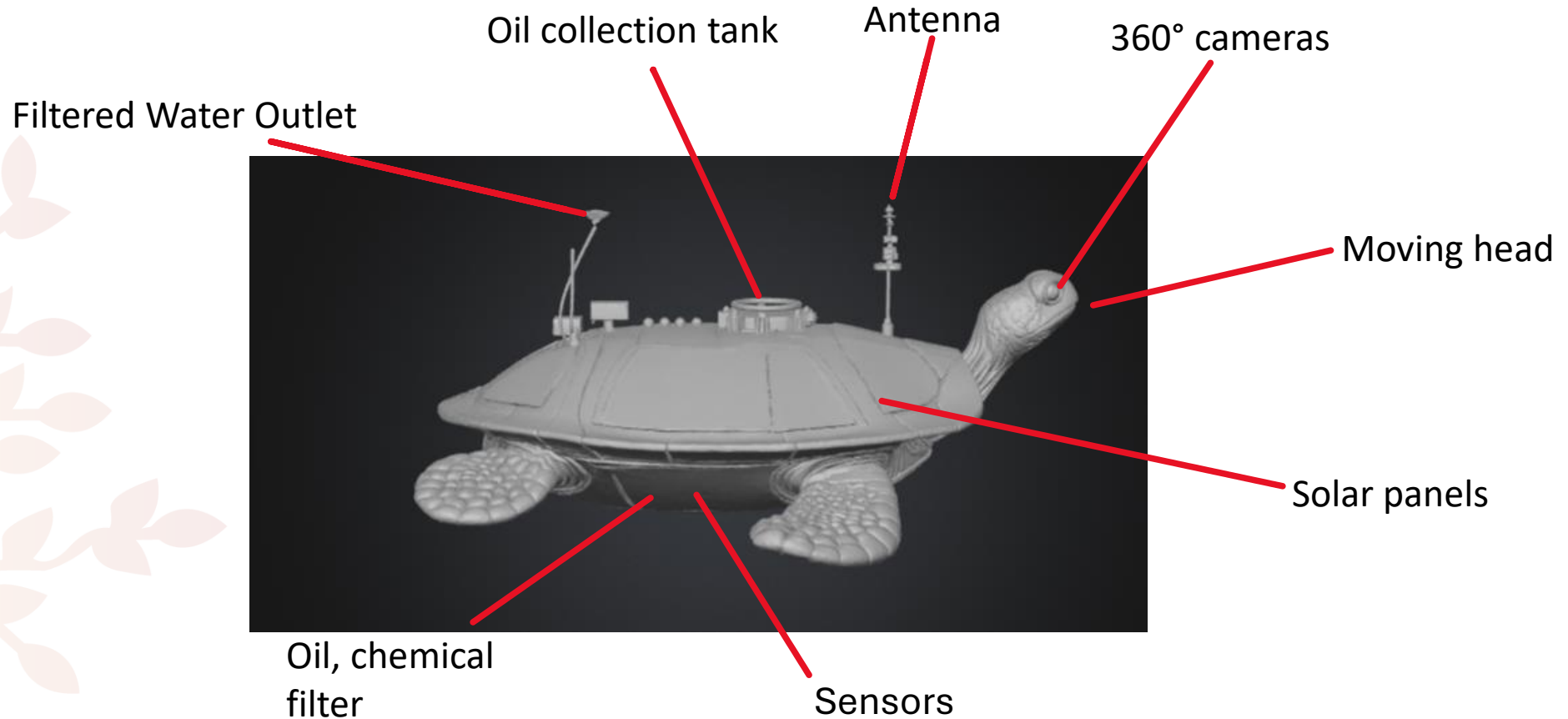
Our problem

- The Baltic Sea is full of microplastics, oils and toxic chemicals.
- Between 1945 and 1947, the Soviet Union dumped nearly 65,000 tons of chemical weapons into the Baltic Sea, which are now rusting and leaking.
- We don't have enough tools to see where leaking and pollution happens and clean up before it affects the marine environment.



Our solution –turtle-shaped floatation device made from recycled materials

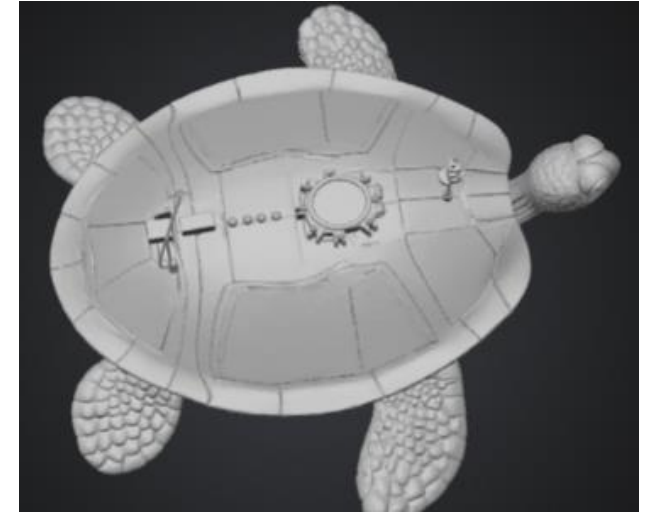
Length: 1m





Additional angles and info

- Turtle sends the collected info to an app which can inform people of the real-time data on sea pollution.
- Turtle collects microplastics and oil using special membranes and magnets.
- Powered by renewable energy.





For raising awareness- A game for youngsters

- For children aged 8-12

Teaches:

- responsibility
- compassion
- importance of keeping our seas clean
- awareness of the condition of the sea

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Gameplay

Canva

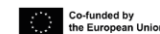
- The player is rewarded for helping the sea



- When the player ignores the problem, the level is failed



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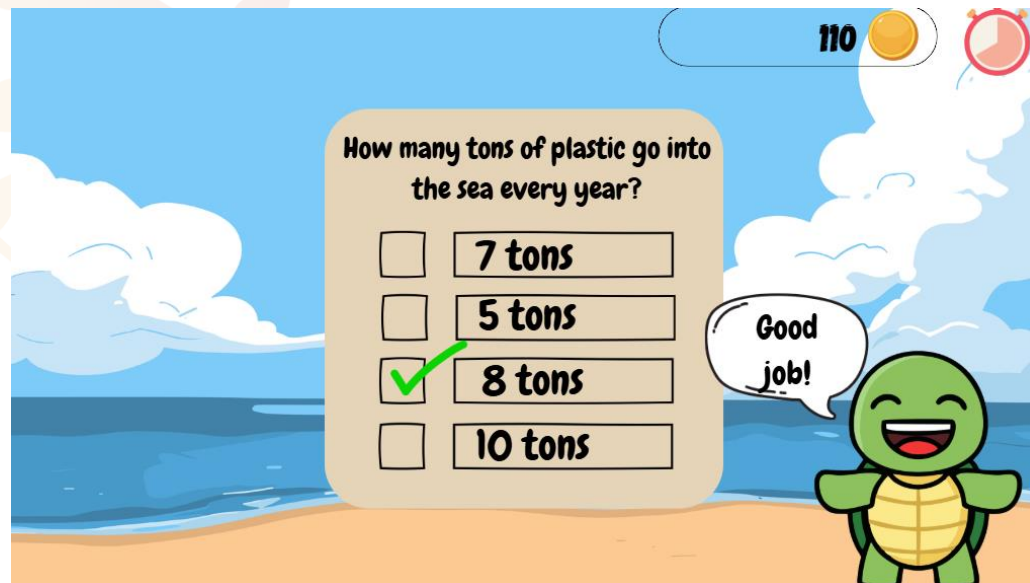


Educational questions

- Children are encouraged to learn facts about the sea
- After answering wrong, kids can try again



The end!





SEA CLEANUP DELUXE

- We coded a prototype of the game.
- Sorting trash and helping turtles.

```
Thonny - C:\Users\albert.birkenfeldt\Downloads\Sea cleanup deluxe.py @ 648 : 1
File Edit View Run Tools Help
Sea cleanup deluxe.py Assistant
472
473 def show_end_screen(player):
474     showing = True
475     while showing:
476         dt = clock.tick(FPS)
477         for e in pygame.event.get():
478             if e.type == pygame.QUIT:
479                 pygame.quit(); sys.exit()
480             if e.type == pygame.KEYDOWN:
481                 if e.key == pygame.K_RETURN:
482                     return # back to menu (new play)
483                 if e.key == pygame.K_ESCAPE:
484                     pygame.quit(); sys.exit()
485
486     # background
487     screen.blit(background, (0, 0))
488
489     # Title (centered)
490     draw_text_center("WELL DONE! You helped the sea!", SCREEN_W // 2, 100, YELLOW, FONT_LARGE)
491
492     # Summary lines (wrapped + centered)
493     summary = "You learned: Plastic -> yellow bin, Metal -> grey bin, Organic -> brown bin."
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Citing sources

- <https://www.err.ee/>
- <https://saartehaal.postimees.ee/>
- https://en.wikipedia.org/wiki/Baltic_Sea
- https://helcom.fi/baltic-sea-trends/hazardous-substances/sea-dumped-chemical-munitions/?utm_source
- [Teadlased on eri meelt, kas Läänemerest vana sõjamoona väljatoomine on ohutu | Eesti | ERR](#)
- [Canva: visuaalne komplekt kõigile](#)
- <https://www.meshy.ai/discover>
- [Detection of Marine Oil Spill from PlanetScope Images Using CNN and Transformer Models](#)
- [Design and Validation of an Eco-Compatible Autonomous Drone for Microplastic Monitoring in Port Environments](#)
- [Development of the Artificial Intelligence and Optical Sensing Methods for Oil Pollution Monitoring of the Sea by Drones](#)
- [Toward Large-Scale Autonomous Monitoring and Sensing of Underwater Pollutants](#)
- [Using Robots to Clean Oil Spills | RoboticsTomorrow](#)



"The sea"

*You people who brought troubles to the sea,
Come together – conspire, rebuild your waters
that sea which once fed you.*

*O nation, you who fouled the deep,
the sea that sustained you -*

*O you who now dread the waves,
Why would you lay waste to your own ocean?*

*O human, undo your error and
save what you have already doomed.*

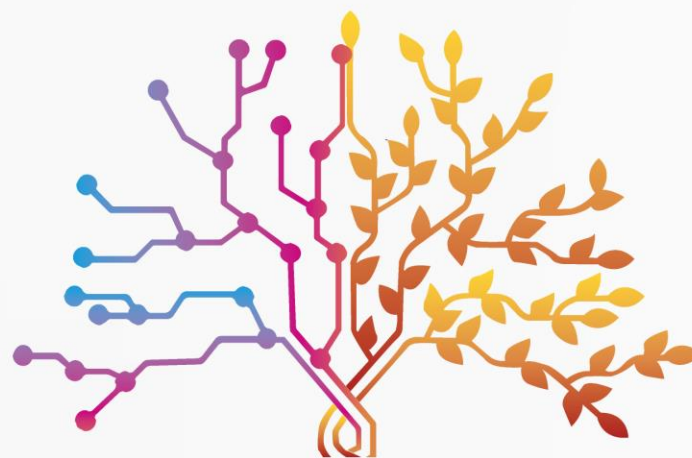
The more we harm, the sharper the pain.

So rise, people – let us lift ourselves as one,

with all our force,

to uproot

our own wickedness



STEAM
BOSS
boosting soft skills

THE BOOST THAT MAKES THE DIFFERENCE



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Saaremaa
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