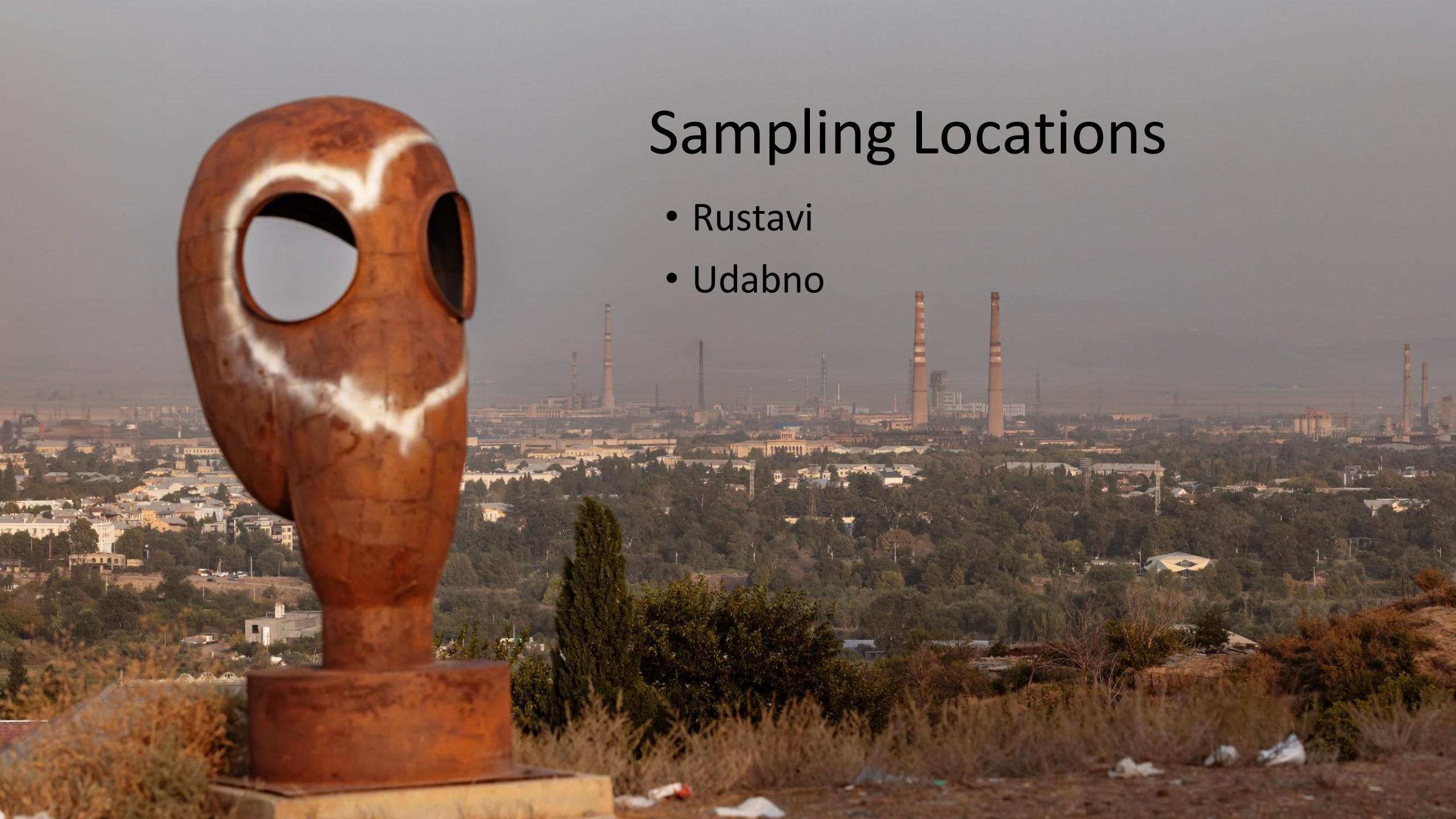




# Environmental findings in Rustavi: Focus on children's playgrounds:

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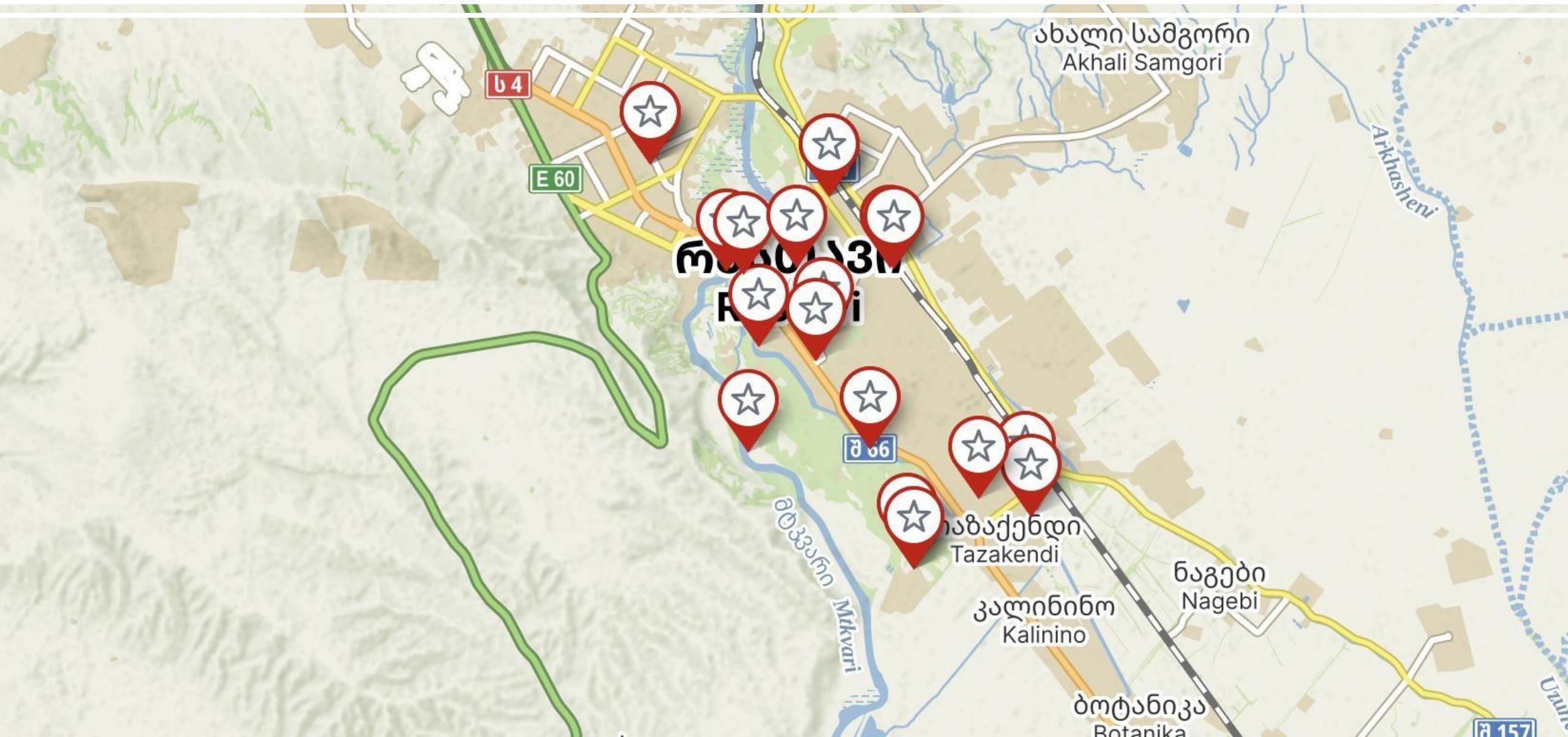
# Sampling Locations

- Rustavi
- Udabno

# Udabno



# Map of selected sampling sites



# Sampling & analyses

- 44 environmental and food samples in total
- 7 of which were soil from children's playgrounds
  - 6 in Rustavi
  - 1 in Udabno (reference sample)
- directly from the surface of the playground or from immediate surroundings
- varying distance from the industrial site
- analysed for heavy metals and selected persistent organic pollutants (POPs) in independent specialized laboratories in the Czech Republic, Netherlands and Germany
  - more detailed info on sampling and analyses in the full report (see QR code in the last slide)

# Examples of sampling sites



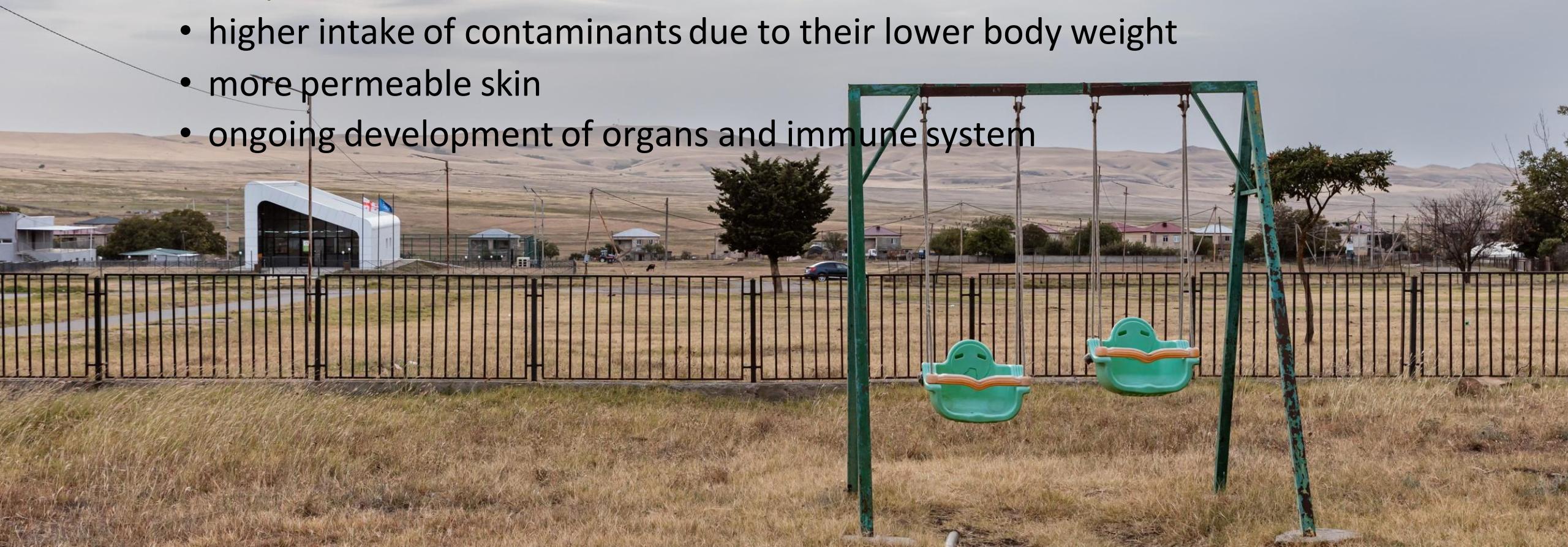






# Why children playgrounds?

- children are especially vulnerable due to
  - frequent hand-to-mouth contact
  - higher intake of contaminants due to their lower body weight
  - more permeable skin
  - ongoing development of organs and immune system



# Special attention to?

- DDTs
  - used as pesticides, especially against mosquitoes and agricultural pests; banned in most countries due to long-term persistence and health risks
- PCBs
  - used in electrical equipment, paints and building materials; banned because they accumulate in the environment and cause serious health effects
- heavy metals
  - such as lead, mercury, cadmium or arsenic; released mainly from industrial pollution, mining and waste; toxic even in small amounts and harmful to health and ecosystems

# POPs in playground soils (Rustavi and reference site Udabno)

Sample	GE-RPG-ID	GE-RPG-1	GE-RPG-2	GE-RPG-3	GE-RPG-4	GE-RPG-5	GE-RPG-6A	GE-RPG-6B	GE-UPG-1
7 PCB	1.97	24.3	4.97	10.4	3.62	0.44	1.82	<0.02	
PeCB	0.33	0.79	0.25	0.37	0.13	0.03	0.10	<0.02	
HCB	0.31	0.22	0.15	0.28	0.48	0.08	0.13	0.02	
HCBD	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
$\Sigma$ HCH	3.98	2.55	4.17	3.44	0.48	0.12	0.31	0.06	
$\Sigma$ DDT	1,087	280	776	265	340	3.85	9.67	0.31	
p.p'-DDT/p.p'-DDE	0.86	0.28	0.46	0.65	0.49	NA	NA	0.17	

Levels are in ng/g dm. All samples had 100% of dry weight.

# POPs in playground soils (Rustavi and reference site Udabno)

Sample	GE-RPG- ID	GE-RPG- 1	GE-RPG- 2	GE-RPG- 3	GE-RPG- 4	GE-RPG- 5	GE-RPG- 6A	GE-RPG- 6B	GE-UPG- 1
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PeCB	0.33	0.79	0.25	0.37	0.13	0.03	0.10	<0.02	
HCB	0.31	0.22	0.15	0.28	0.48	0.08	0.13	0.02	
HCBD	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Σ HCH	3.98	2.55	4.17	3.44	0.48	0.12	0.31	0.06	
Σ DDT	1,087	280	776	265	340	3.85	9.67	0.31	
p,p'-DDT/p,p'-DDE	0.86	0.28	0.46	0.65	0.49	NA	NA	0.17	

Levels are in ng/g dm. All samples had 100% of dry weight.

# POPs in playground soils (Rustavi and reference site Udabno)

Sample	GE-RPG- ID	GE-RPG- 1	GE-RPG- 2	GE-RPG- 3	GE-RPG- 4	GE-RPG- 5	GE-RPG- 6A	GE-RPG- 6B	GE-UPG- 1
7 PCB	1.97	24.3	4.97	10.4	3.62	0.44	1.82	<0.02	
PeCB	0.33	0.79	0.25	0.37	0.13	0.03	0.10	<0.02	
HCB	0.31	0.22	0.15	0.28	0.48	0.08	0.13	0.02	
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$\Sigma$ HCH	3.98	2.55	4.17	3.44	0.48	0.12	0.31	0.06	
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p.p'- DDT/p.p'- DDE									
	0.86	0.28	0.46	0.65	0.49	NA	NA	0.17	

Levels are in ng/g dm. All samples had 100% of dry weight.

# 3 ingestion scenarios for POPs

- based on a meta-review, the values for soil ingestion range from 400 to 41,000 mg/day
  - estimated daily intake for DDT:
    - 100 mg/day → 108.7 ng/day of DDTs and 0.197 ng/day of PCBs
    - 400 mg/day → 434.8 ng/day of DDTs and 0.788 ng/day of PCBs
    - 1000 mg/day → 1,087 ng/day of DDTs and 1.97 ng/day of PCBs
  - for a 15-kg child:
    - 7.25, 29.0, and 72.5 ng/kg bw/day of DDTs
    - 0.013, 0.053, and 0.131 ng/kg bw/day of PCBs
  - no TDI is set for DDT by EFSA; in Australia, the reference value is 2 µg/kg bw/day, which is not exceeded, but cumulative exposure to multiple POPs may still pose a health risk

# Selected heavy metals in playground soils (Rustavi and Udabno)

Element	GE-RPG-1	GE-RPG-2	GE-RPG-3	GE-RPG-4	GE-RPG-5	GE-RPG-6/A	GE-RPG-6/B	GE-UPG-01 (ref.)
Mercury (Hg)	0.55	0.089	0.066	0.074	0.05	0.005	0.009	0.022
Lead (Pb)	25.8	57.7	83	99.8	24.7	4.29	17.3	12.8
Cadmium (Cd)	0.577	1.63	0.925	0.619	0.414	0.027	0.129	0.194
Copper (Cu)	50.5	138	91	60.7	48	6.9	13.9	39
Chromium (Cr)	44.2	105	46.1	58.6	41.8	58.9	97.7	46.3
Zinc (Zn)	387.5	851.6	448	243	178.5	131.2	313	67.6
Arsenic (As)	6.9	8.49	4.49	6.05	5.0	2.26	1.93	7.1

mg/kg

# Comparison with Heavy Metals in Playground Soils in Central Kazakhstan

	Central Kazakhstan		This study	
Element	Range (mg/kg)	Average (mg/kg)	Range (mg/kg)	Average (mg/kg)
Lead (Pb)	13.9 – 2,410	392.5	4.29 – 99.8	44.7
Cadmium (Cd)	0–15.3	1.86	0.027 – 1.63	0.62
Copper (Cu)	13.9 – 4,866	465.6	6.9–138	58.4
Chromium (Cr)	0–42.2	17.3	41.8–105	64.6
Zinc (Zn)	43.6 – 1,302	276.8	131.2–851.6	364.7
Arsenic (As)	0–232.2	22.6	1.93 – 8.49	5.0
Mercury (Hg)	0.028 – 0.458	0.10	0.005–0.55	0.12

# Czech Hygienic Limits in comparison with average levels in Rustavi

Element	Average in Rustavi (mg/kg)	Czech hygienic limit for sandboxes (mg/kg)	Limit exceeded
Arsenic (As)	5.0	10.0	No
Cadmium (Cd)	0.6	0.5	Yes
Chromium (Cr)	64.6	100.0	No
Copper (Cu)	58.4	100.0	No
Mercury (Hg)	0.12	0.3	No
Lead (Pb)	44.7	60.0	Yes
Zinc (Zn)	364.7	150.0	Yes

*Maximum allowable concentrations in children's playground sandboxes (mg/kg dry weight)*

# Comparison with Other Contaminated Playgrounds and Parks

Author, (year)	Parlak et al. (2022)	Park and Ji (2023)	Zglobicki et al. (2021)	Li et al. (2023)	Donado et al. (2021)	Shezi et al. (2022)	Figueiredo et al. (2011)
environment	playgrounds	parks, mean c	playground, mean c	parks	playgrounds	preschool facilities	playground soils
Country	Türkiye	South Korea	Poland	China	Colombia	Cape Town	São Paulo
Hg	na	0.02	0.027	na	0.1	na	na
Pb	3-102	7.55	41	34.89	89	30	na
Cd	na	0.21	4.7	2.52	2.1	na	na
Cu	19-92	5.97	16.3	31.39	39.0	na	na
Cr	8-34	nd	192.4	58.74	27	na	na
Zn	58 (only avg)	34.08	79.8	186.28	204	232	na
As	na	2.40	na	na	26	16	1.2-24

mg/kg

# Future of those playgrounds?

- the findings highlight the presence of toxic elements in soils frequently used by children, underscoring potential long-term health risks. This calls for site-specific risk assessment, regular monitoring of playground soil quality, and consideration of remediation and protective policies in recreational areas.



# Next steps

- **Regular monitoring** of soil quality at playgrounds and other recreational areas
- **Detailed site-specific risk assessments** for the most contaminated locations
- **Remediation measures** where contamination poses risks (e.g. soil replacement, covering, safe landscaping)
- **Protective policies** to prevent children's exposure (maintenance, awareness campaigns, safe design of playgrounds)
- **Stronger regulation and enforcement** on industrial emissions and waste management to stop further pollution

# download the full report here

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Toxic Hot Spots in Rustavi, Georgia  
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