“TSUNAGARUKA” PROJECT
-Connection among Forests, Rivers and the Sea for the Solution of Seafloor Litter Problem

Sanyo Girls’ Junior & Senior High School
JAPAN
Noe Saito
1. The General View of the Seto Inland Sea

- The largest inland sea in Japan
- Floor space: About 20,000 km² & Watershed Area: About 50,000 km²
- Area population: 30 million people
2. Categories of Marine Litter

- Drifted Litter
  - Garbage reached the shore
  - Collected by local officials

- Floating Litter
  - Garbage floating in the sea
  - Collected by vessels

- Seafloor Litter
  - Litter piling on seafloor.
  - No collectors

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Weight of Marine Litter in the Seto Inland Sea

- Plastic
- Plastic bags
- Aluminum cans
- Steel cans
- Steel
- Plastic bottles

(2014.10.11 Collection)
PROBLEMS! Knowledge of seafloor litter varies in different areas

- Seafloor litter problem is recognized as merely local problem in the coastal area.
- Household waste flows into the sea through the rivers AND the rivers run through various areas including the mountainous areas, big cities and the coastal areas.

TSUNAGARUKA (Connection) PROJECT

① Common & Mutual Understanding and cooperation by whole areas
② Take actions “before it sinks in the sea”, “before it flows into the sea”, “before people discard waste”

Our Activities for the Solution of Seafloor Litter Problem
① Collect Seafloor Litter (To reduce litter on seafloor)
② Awareness Campaign (To reduce household waste disposal)

Our activities were not enough to get active reactions by residents

③ VISUALIZATION PROJECT
(Visualize seafloor litter for more understanding and active response by people)
4. Awareness of Seafloor Litter in Coastal Areas

Well Informed through

- media like TV
- workshops & exhibitions
- education at school

Feel Responsible for Sea Environment

Takahashi River
Nariwa River
Oda River
Asaguchi
Kasaoka
Kurashiki
Tamano
Okayama
Setouchi
Bizen
Sakaide
Takamatsu

Awareness of Seafloor Litter in Coastal Areas

<table>
<thead>
<tr>
<th>Location</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kasoka</td>
<td>97%</td>
<td>3%</td>
</tr>
<tr>
<td>Kurashiki</td>
<td>95%</td>
<td>5%</td>
</tr>
<tr>
<td>Setouchi</td>
<td>87%</td>
<td>13%</td>
</tr>
<tr>
<td>Bizen</td>
<td>99%</td>
<td>1%</td>
</tr>
<tr>
<td>Tamano</td>
<td>94%</td>
<td>6%</td>
</tr>
<tr>
<td>Asakuchi</td>
<td>98%</td>
<td>2%</td>
</tr>
<tr>
<td>Okayama</td>
<td>85%</td>
<td>15%</td>
</tr>
<tr>
<td>Takamatsu</td>
<td>84%</td>
<td>16%</td>
</tr>
<tr>
<td>Sakaide</td>
<td>87%</td>
<td>13%</td>
</tr>
</tbody>
</table>

(100 persons, 2015)
5. Awareness at Upper Basin of the Takahashi River

Awareness at Upper Basin of the Takahashi River

- Little information → media only
- Unrecognized origin of litter
- Indifference to the problem → Great distance from the Seto Inland Sea

![Map of the research area](image)

![Bar chart showing awareness levels](chart)

- Kasaoka: 3% Yes, 97% No
- Kurashiki: 5% Yes, 95% No
- Soja: 14% Yes, 86% No
- Takahashi: 26% Yes, 74% No
- Niimi: 44% Yes, 56% No
- Ibara: 48% Yes, 52% No
- Kibichuo: 52% Yes, 48% No

(100 persons, 2015)
6. Litter Research in the Takahashi River Basin

A point (Upstream)

E Point (Middle-stream)

I Point (Downstream)

Distance between Research Points and River Mouth

Takahashi River

Nariwa River

Oda River

Distance:
- A point (83km)
- B point (67km)
- C point (43km)
- D point (39km)
- E point (23km)
- F point (14km)
- G point (10.2km)
- H point (6.4km)
- I point (0.5km)
7. Research of Drifted Litter

The number of debris 182 pieces → drifted in the river for a long time

Number of Litter Pieces at Each Point

- Plastic
- Plastic bags
- Burning garbage
- Steel cans
- Flaming retardant garbage
- Aluminum cans
- Plastic bottles
- Bottles
- Wire
- Rope (work gloves)

(1 hour, 10m × 100m = 1,000m²)
## 8. Results of Research of Drifted Litter

<table>
<thead>
<tr>
<th>Point</th>
<th>City</th>
<th>Distance from River Mouth</th>
<th>Collected Pieces</th>
<th>Average</th>
<th>Population (10,000)</th>
<th>Discarded piece per person (10^-7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Niimi</td>
<td>83km</td>
<td>28</td>
<td>20</td>
<td>4</td>
<td>487</td>
</tr>
<tr>
<td></td>
<td></td>
<td>67km</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Takahashi</td>
<td>43km</td>
<td>29</td>
<td>38</td>
<td>4</td>
<td>937</td>
</tr>
<tr>
<td></td>
<td></td>
<td>39km</td>
<td>46</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>Soja</td>
<td>23km</td>
<td>34</td>
<td>34</td>
<td>6.4</td>
<td>530</td>
</tr>
<tr>
<td></td>
<td></td>
<td>14km</td>
<td>87</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>10.2km</td>
<td>70</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Kurashiki</td>
<td>6.4km</td>
<td>129</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td></td>
<td>143 (Exclude debris)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td></td>
<td>303 (Without debris)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Collected Pieces and Disposed piece per Person**

- Amount of litter is in proportion to the population of areas.
- Discarded amount per person is almost the same at each point.
## 9. Comparison of Rivers in Japan & World

<table>
<thead>
<tr>
<th>Name</th>
<th>Distance (km)</th>
<th>Altitude difference (km)</th>
<th>Incline (altitude difference / distance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Takahashi River (Japan)</td>
<td>111</td>
<td>1.188</td>
<td>1.07</td>
</tr>
<tr>
<td>Shinano River (Japan)</td>
<td>367</td>
<td>2.475</td>
<td>0.67</td>
</tr>
<tr>
<td>Tone River (Japan)</td>
<td>322</td>
<td>1.800</td>
<td>0.56</td>
</tr>
<tr>
<td>Mekong River (Vietnam)</td>
<td>4,350</td>
<td>5.200</td>
<td>0.12</td>
</tr>
<tr>
<td>Amazonas River (Brazil)</td>
<td>6,516</td>
<td>5.597</td>
<td>0.09</td>
</tr>
<tr>
<td>Rhein River (Germany)</td>
<td>4,350</td>
<td>1.602</td>
<td>0.04</td>
</tr>
<tr>
<td>Lena River (Russia)</td>
<td>4,400</td>
<td>1.640</td>
<td>0.04</td>
</tr>
<tr>
<td>Nile River (Egypt)</td>
<td>6,695</td>
<td>1.134</td>
<td>0.02</td>
</tr>
<tr>
<td>Mississippi River (America)</td>
<td>5,964</td>
<td>0.450</td>
<td>0.01</td>
</tr>
<tr>
<td>Volga River (Russia)</td>
<td>3,690</td>
<td>0.225</td>
<td>0.006</td>
</tr>
</tbody>
</table>

### Japan
- **Gradient**: High
- **Water flow**: Rapid
- **Length**: Short

### World
- **Gradient**: Low
- **Water flow**: Slow
- **Length**: Long

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It’s important not to discard litter in river (before it flows into the sea)
10. Connection between Coastal Areas and Inland Areas

Challenges to Connect Coastal Areas and Inland Areas

- Visit to Inland Areas to Share Information (2015.11)
- Lecture for Local Residents in Mountainous Regions (2015.8)

Deliver Information on Seafloor Litter Problem to People in Inland

Deeper Common & Mutual Understanding between Coastal Areas and Inland Areas
11. TSUNAGARUKA (Connection) in the Coast

Challenges Together with Coastal Residents
Collect Litter Using Dragnet with High School Students in Coastal Areas

Learn from Handmade Picture Story in Advance (2015.10)
Experience Collecting Seafloor Litter (2015.10)

Challenges Together with Residents on the Opposite Shore
Collect Litter on Teshima Island (Marugame, Kagawa Prefecture), Opposite Shore

Found geographic information of the opposite shore (2015.8)
Soccer ball came from H point (research point) of the Takahashi River in Okayama
Exhibition & lecture held in the museum on the opposite shore (2015.11)
12. Present Achievement

How much people living in the inland area are aware of the coastal area (Before Learning)

- Do you realize the upper basin joins the down basin in a river? 
  Before: 11% Yes, 89% No
  After: 79% Yes, 21% No

- Are you aware that sea floor litter is flown from the urban area? 
  Before: 72% Yes, 28% No
  After: 35% Yes, 75% No

- Do you know the litter coming from the inland area ends up in sea floor? 
  Before: 17% Yes, 83% No
  After: 0% Yes, 100% No

- Do you care about the down basin in our daily lives? 
  Before: 5% Yes, 95% No
  After: 84% Yes, 16% No

- Do you know there is more litter in the down basin than in the upper basin? 
  Before: 93% Yes, 7% No
  After: 100% Yes, 0% No

After

- Higher and Stronger Connection
- More cooperation due to better understanding
  - Waste from inland area also damages sea environment-
13. Conclusion

Problems
- Litter Increase > Litter Collection
- Knowledge of seafloor litter various in different areas

Our activities
- Share information in wide areas

MUTUAL UNDERSTANDING
- Residents in each area need to consider each other.

COMMON UNDERSTANDING
- Solve the problem together.

FEEL A STRONG CONNECTION
- SEAFLOOR LITTER IS A CONCERN FOR ALL
Surrounding environment greatly affects Environmentally friendly life of the resident in wide areas along the rivers improve sea environment

14. Let’s Conserve Our Sea Together
THANK YOU.