Responding locally to global and globalizing changes






Content

1. Ecological/traditional knowledge

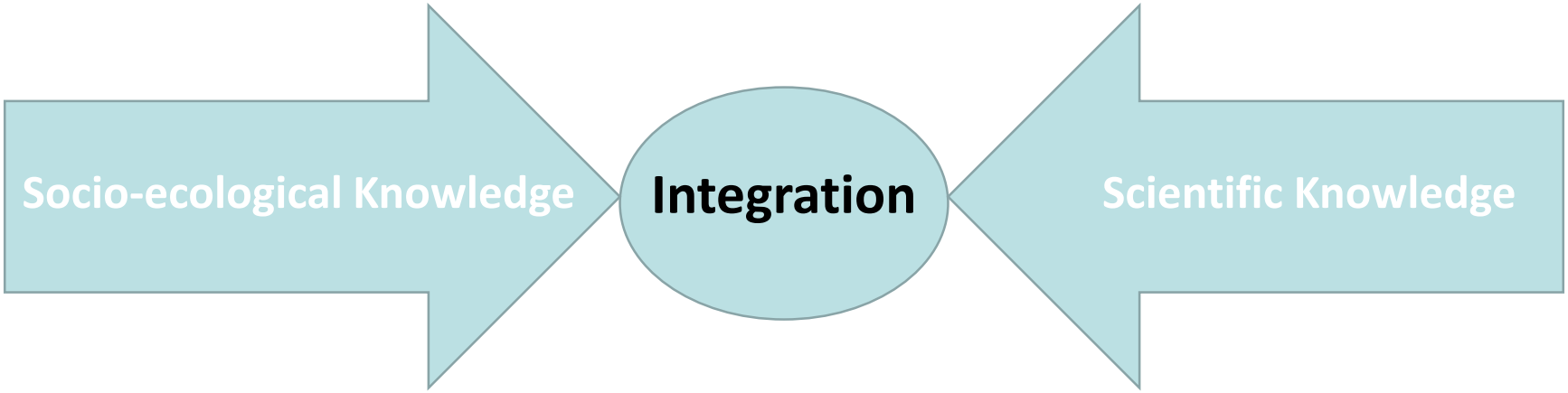
2. Environmental education – participation

3. Qualitative methods:
   - Drawings
   - PGIS

4. Case studies

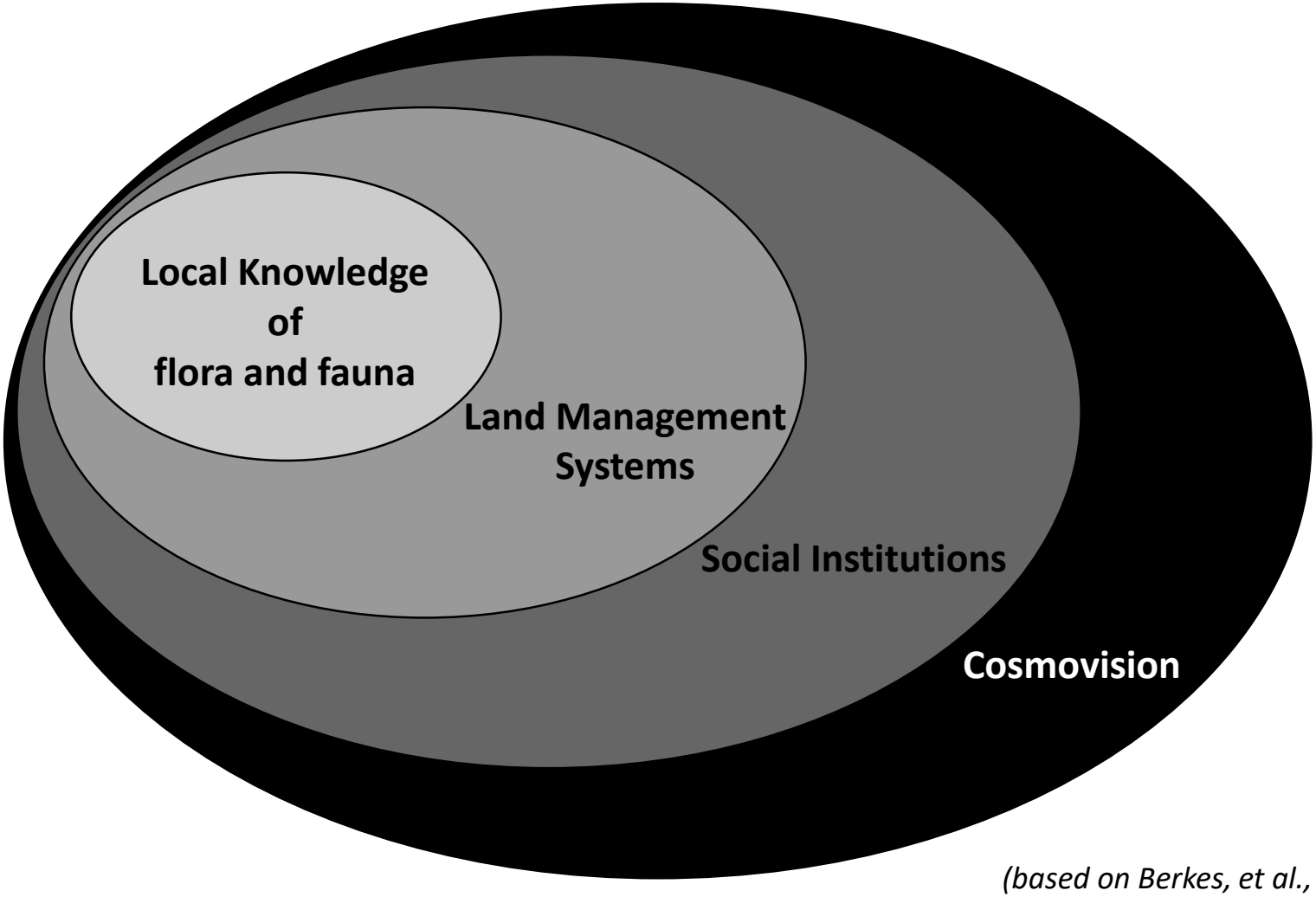
1. Ecological/Traditional Knowledge

- "*Diversity in nature and culture makes us human*" (Harmon, 2002, p. 1)



- Scientific research as "*processes of co-production*"(Kates et al., 2000, p.2)

1. Ecological/Traditional Knowledge



(based on Berkes, et al., 2000)

2. Environmental Education

- EE is a **social transformation tool** that is nourished by different disciplines with the aim to provide knowledge and to generate social learning processes in order to face the current complexity.

- EE permits to identify a wide range of socioenvironmental issues and also to propose effective solutions.

- EE uses a wide range of different techniques and methodologies in order to accomplish with its own objectives (*Tiblisi Declaration* 1977). The world's first intergovernmental conference on environmental education was organized by the United Nations Education, Scientific, and Cultural Organization (UNESCO) in cooperation with the U.N. Environment Programme (UNEP). http://www.gdrc.org/uem/ee/tbilisi.html

2. Environmental Education

- The contemporary EE must focus its objectives towards a better learning and understanding of biodiversity in order to avoid the increasing distance and disengagement between society and nature.

- **Children and teenagers are crucial stakeholders which are traditionally excluded from the decision making processes.**

2. Environmental Education

EE implies a **new codification** of our relation with the environment which has strong influence in the development of new approaches, new forms of learning and new conservation and management proposals (participation).

Interdisciplinary

Change of values and attitudes

Relation between causes and effects

Global sense

New approaches, actions and perspectives: Sustainability science

Developed countries (70's)	Developing countries (80's)
EE mainly related with school, formal education	EE has been developed in rural contexts, non-formal education.
EE focussed on the conservation of nature. It is also worried about avoiding or decreasing the abuse of natural resources and the high rates of consume.	EE mainly related with the inappropriate coverage of the elementary needs (illiteracy, access to water, malnutrition…).
Contradictory approach: the theoretical level against the lack of practical experiences.	Diverse discourses which generate innovative scenarios both theoretical and practical.

2. Environmental Education. Tools

To make an effective contribution towards improving the environment, educational action must be linked with legislation, policies, measures of control, and the decisions that governments may adopt in relation to the human environment.

Awareness | **Attitudes** | **Participation** | **Knowledge** | **Skills**

Environmental Education objectives

Learning

- **Drawings**
- **Questionnaires**
- **P-GIS**
- **Pedagogical materials**
- **Others…**

2. Environmental Education and SDG

- Enrolment in primary education in developing countries has reached 91 per cent but **57 million primary age children remain out of school**.

- More than half of children that have not enrolled in school live in **sub-Saharan Africa**.

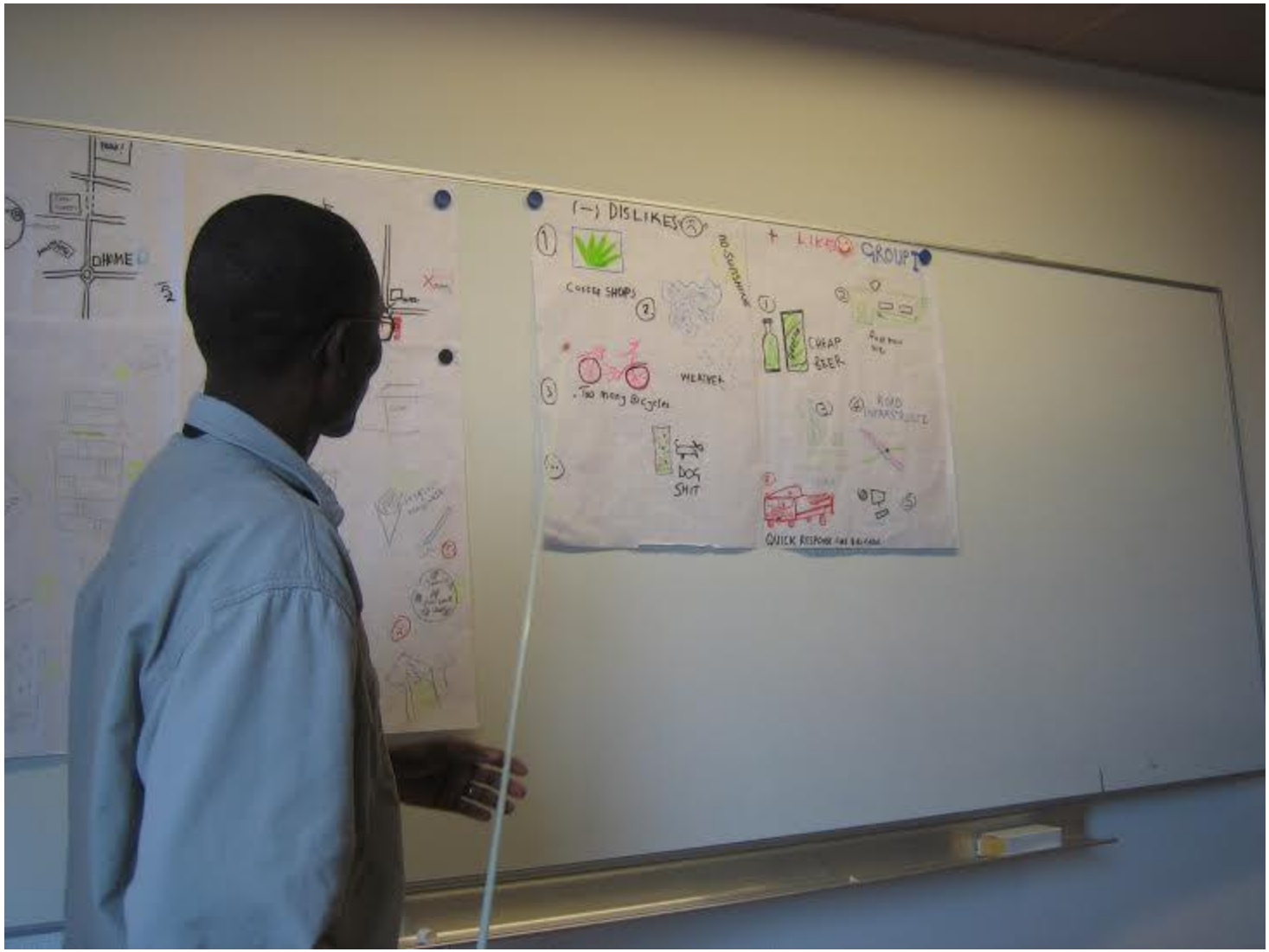
- An estimated 50 per cent of out-of-school children of primary school age live in **conflict-affected areas**.

3. Qualitative and quantitative methods. Drawings: a participatory tool

- Efficient strategy across different cultures (Literat, 2013) and languages
- Age appropriate method
- No/Low influence of the researcher
- Go beyond language barriers
- Achieve children's rights
- Involvement in decision making processes
- Increase empowerment and sense of inclusiveness
- Give them a voice (muted actors)

3. Drawings, not only for children


I learned


(-) DISLIKES
+ LIKES
GROUP
Coffee SHOPS
WEAVER
CHEAP BEER
DOG SHIT


(-) DISLIKES
COFFEE SHOPS
WEATHER
Too many Bicycles
DOG SHIT
CHEAP BEER
DISLIKES
LIKES

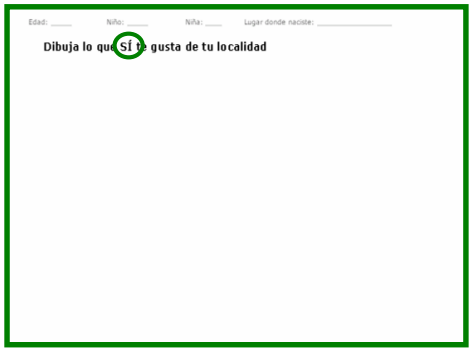

I discovered
...

Making drawings with children

Primary school pupils (aged between 6 and 12)

Advantages

- Drawings are an easy way for children to represent their feelings, attitudes
- Children enjoy using this method without being stressed
- Overcome linguistic boundaries so as to permit comparisons between different languages.
- Reflect mental images of the children that represent their feelings and emotions in relation to their world.



Drawbacks

- To represent the real world on a piece of paper is not straightforward.
- Certain feelings or emotions are not communicable or representable

Working with teenagers

Questionnaires (secondary school)

1. *¿Qué es lo que SÍ te gusta de tu localidad? ¿Por qué?*

   - What do you like about your locality? Why?

2. *¿Qué es lo que NO te gusta de tu localidad? ¿Por qué?*

   - What do you not like about your locality? Why?

3. *¿Qué cambiarías de tu localidad? ¿Por qué? ¿Cómo lo harías?*

   - What would you like to change in your locality? Why? How?

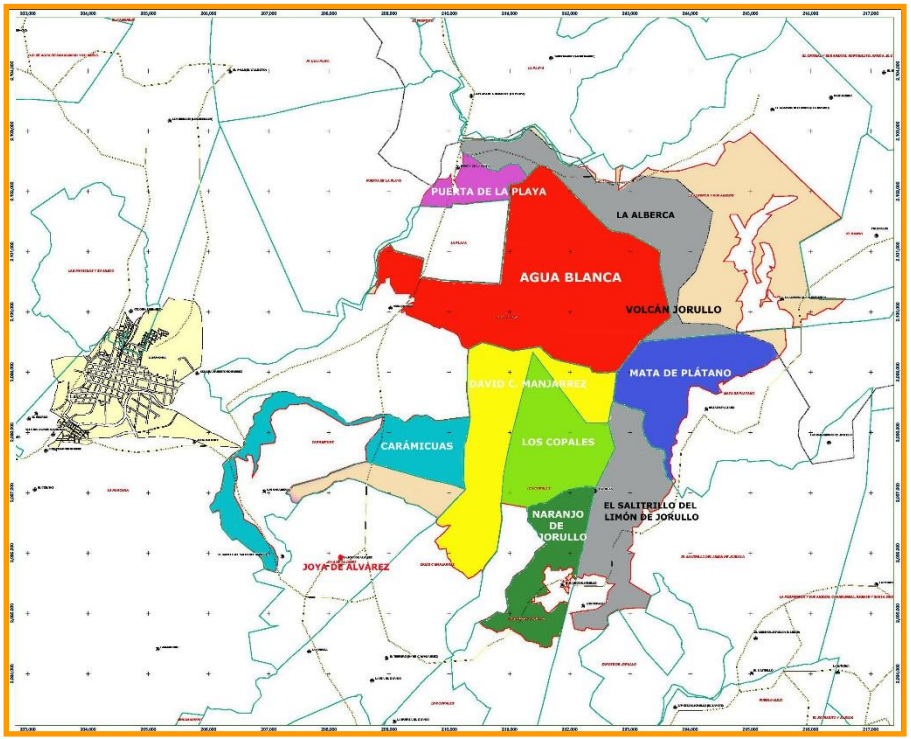
La Huacana

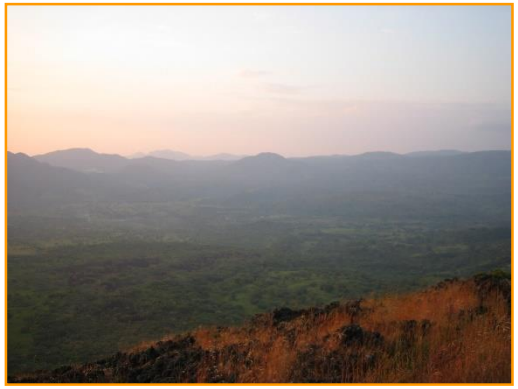
La Huacana municipality

- Extension: 2.000 km^2
- Administration: 120 localities
- Land holdings: 63 *ejidos*
- Capital: La Huacana
- Population: 31.774 inhabitants (2005)
- High rate of emigration
    - Intercity
    - USA

La Huacana

- La Huacana (9.110 hab.)
- Puerta de la Playa (263 hab.)
- Agua Blanca (447 hab.)
- Mata de Plátano (509 hab.)
- Naranjo de Jorullo (230 hab.)
- Los Copales (307 hab.)
- David C. Manjarrez (?)
- Joya de Álvarez (134 hab.)
- Las Carámicuas (78 hab.)





Criteria for sample selection

Membership of localities around the Natural Protected Area “Volcán El Jorullo”

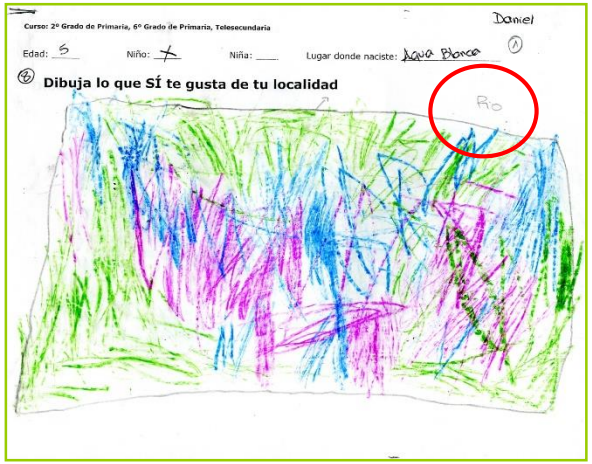
2nd to 6th grade of primary school (aged 6 to 12)

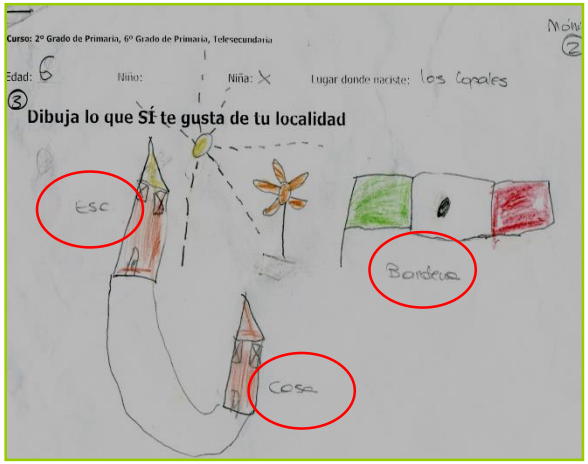
3rd grade of secondary school (aged 14)

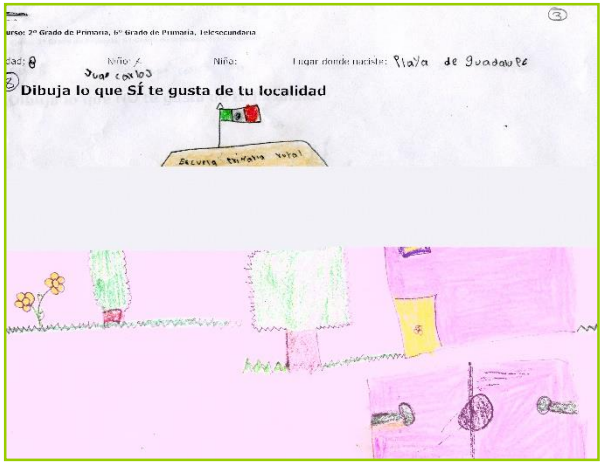
INTERPRETATION OF SOCIO-ENVIRONMENTAL PERCEPTIONS

Dependent variable: perceptions

Children's interpretation of their own drawings







Selection of keywords

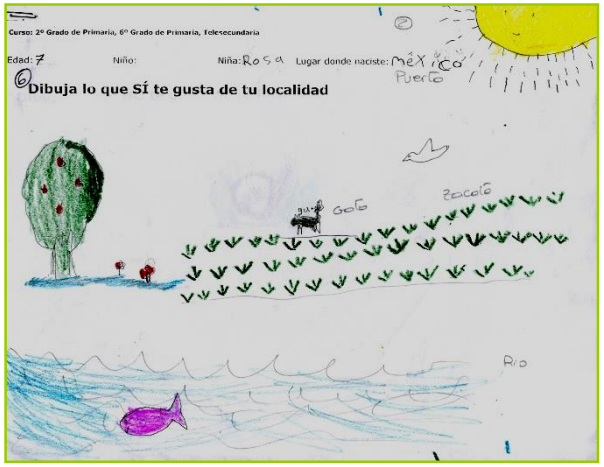
Construction of thematic categories (17)

Nature, Personal, Poisonous animals, Environmental quality, Climate, Politics, Religion, Social, Volcano, Locality, Accidents, Conflicts between communities, Lack of infrastructure, Infrastructure, Landmark, Security and Cultural

Perceptions as positive (preferences) or negative (dislikes)

Independent variables: structural factors

- Age
- Educational level
- Sex
- Membership of *ejidos*
- Rural or urban context



INTERPRETATION OF SOCIO-ENVIRONMENTAL PERCEPTIONS

Preferences and dislikes

Preferencias	Frecuencia	Porcentaje
Naturaleza	153	37,60%
Personal	74	18,20%
Animales ponzoñosos	5	1,20%
Clima	14	3,40%
Religión	12	2,90%
Social	2	0,50%
Volcán	30	7,40%
Localidad	5	1,20%
Falta Infraestructuras	2	0,50%
Infraestructuras	99	24,30%
Punto Geográfico	6	1,50%
Seguridad	1	0,20%
Cultural	4	1,00%
Total	407	100,00%

Deficiencias	Frecuencia	Porcentaje
Naturaleza	20	6,20%
Personal	23	7,20%
Animales ponzoñosos	61	19,00%
Ambiental	76	23,70%
Clima	12	3,70%
Político	3	0,90%
Social	39	12,10%
Volcán	3	0,90%
Accidentes	6	1,90%
Conflicto entre comunidades	3	0,90%
Falta Infraestructuras	41	12,80%
Infraestructuras	16	5,00%
Punto Geográfico	9	2,80%
Seguridad	3	0,90%
Cultural	6	1,90%
Total	321	100,00%

Religion and Locality are important only for preferences

Politics, Environmental quality, Conflicts between communities and accidents are important only for dislikes.

INTERPRETATION OF SOCIO-ENVIRONMENTAL PERCEPTIONS

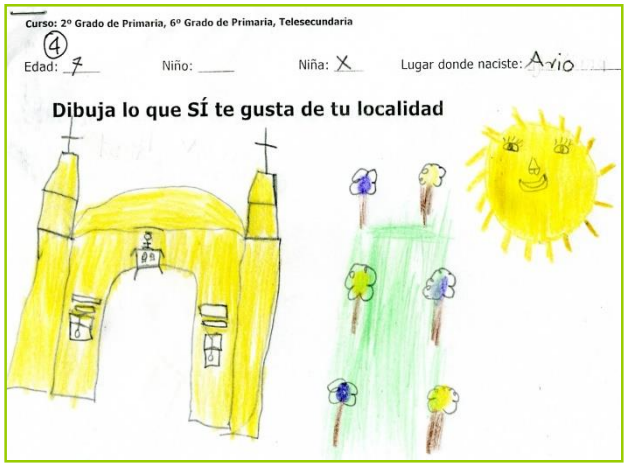
Preference: age

Preferencias		Edad												Total
		5	6	7	8	9	10	11	12	13	14	15	17	
Naturaleza	Recuento	4	19	25	13	9	16	25	8	6	23	3	2	153
	% dentro de edad	57,10%	48,70%	30,90%	31,70%	52,90%	43,20%	30,50%	40,00%	33,30%	44,20%	30,00%	66,70%	
Personal	Recuento	2	15	22	17	4	4	6	2	1	1	0	0	74
	% dentro de edad	28,60%	38,50%	27,20%	41,50%	23,50%	10,80%	7,30%	10,00%	5,60%	1,90%	0,00%	0,00%	
Animales ponzoñosos	Recuento	0	0	1	2	0	2	0	0	0	0	0	0	5
	% dentro de edad	0,00%	0,00%	1,20%	4,90%	0,00%	5,40%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	
Clima	Recuento	1	1	0	0	0	0	0	0	2	8	2	0	14
	% dentro de edad	14,30%	2,60%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	11,10%	15,40%	20,00%	0,00%	
Religión	Recuento	0	0	2	0	0	2	7	1	0	0	0	0	12
	% dentro de edad	0,00%	0,00%	2,50%	0,00%	0,00%	5,40%	8,50%	5,00%	0,00%	0,00%	0,00%	0,00%	
Social	Recuento	0	0	0	0	0	0	0	0	0	2	0	0	2
	% dentro de edad	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	3,80%	0,00%	0,00%	
Volcan	Recuento	0	0	6	6	1	0	5	2	3	4	2	1	30
	% dentro de edad	0,00%	0,00%	7,40%	14,60%	5,90%	0,00%	6,10%	10,00%	16,70%	7,70%	20,00%	33,30%	
Localidad	Recuento	0	0	0	0	0	0	0	0	2	2	1	0	5
	% dentro de edad	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	11,10%	3,80%	10,00%	0,00%	
Falta Infraestructuras	Recuento	0	0	1	0	0	0	0	0	0	1	0	0	2
	% dentro de edad	0,00%	0,00%	1,20%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	1,90%	0,00%	0,00%	
Infraestructuras	Recuento	0	3	22	3	3	11	39	7	1	8	2	0	99
	% dentro de edad	0,00%	7,70%	27,20%	7,30%	17,60%	29,70%	47,60%	35,00%	5,60%	15,40%	20,00%	0,00%	
Punto Geográfico	Recuento	0	1	1	0	0	2	0	0	1	1	0	0	6
	% dentro de edad	0,00%	2,60%	1,20%	0,00%	0,00%	5,40%	0,00%	0,00%	5,60%	1,90%	0,00%	0,00%	
Seguridad	Recuento	0	0	0	0	0	0	0	0	1	0	0	0	1
	% dentro de edad	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	5,60%	0,00%	0,00%	0,00%	
Cultural	Recuento	0	0	1	0	0	0	0	0	1	2	0	0	4
	% dentro de edad	0,00%	0,00%	1,20%	0,00%	0,00%	0,00%	0,00%	0,00%	5,60%	3,80%	0,00%	0,00%	
Total	Recuento	7	39	81	41	17	37	82	20	18	52	10	3	407

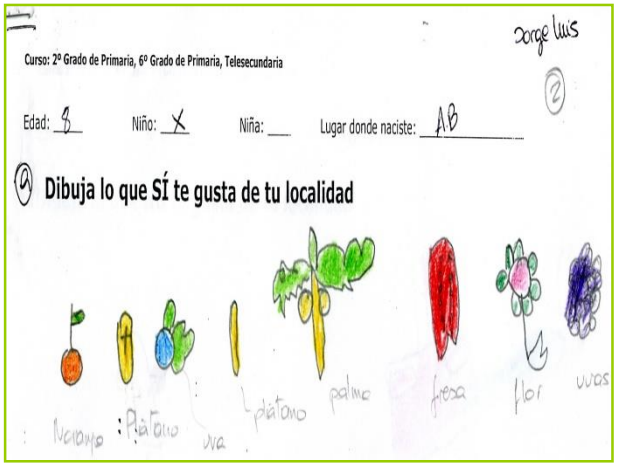
INTERPRETATION OF SOCIO-ENVIRONMENTAL PERCEPTIONS

Preferences: age

Boy (6 years old), Joya de Álvarez



Girl (7 years old), La Huacana



Boy (8 years old), Agua Blanca

Girl (10 years old), Naranjo de Jorullo

Girl (11 years old), Los Copales

Girl (11 years old), Mata de Plátano

INTERPRETATION OF SOCIO-ENVIRONMENTAL PERCEPTIONS

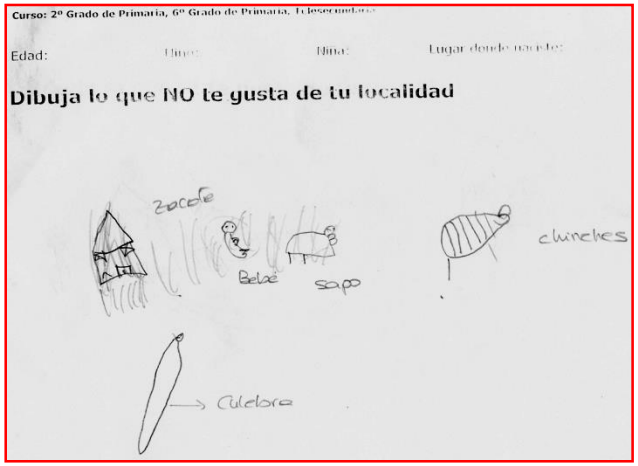
Dislikes: age

Deficiencias		Edad												Total
		5	6	7	8	9	10	11	12	13	14	15	17	
Naturaleza	Recuento	0	3	6	5	4	0	1	1	0	0	0	0	20
	% dentro de edad	0,00%	10,00%	9,70%	16,70%	26,70%	0,00%	1,70%	5,90%	0,00%	0,00%	0,00%	0,00%	
Personal	Recuento	0	5	8	4	0	2	3	1	0	0	0	0	23
	% dentro de edad	0,00%	16,70%	12,90%	13,30%	0,00%	6,30%	5,00%	5,90%	0,00%	0,00%	0,00%	0,00%	
Animales ponzoñosos	Recuento	1	15	15	7	3	8	7	1	2	2	0	0	61
	% dentro de edad	25,00%	50,00%	24,20%	23,30%	20,00%	25,00%	11,70%	5,90%	11,10%	4,90%	0,00%	0,00%	
Ambiental	Recuento	2	1	19	3	5	7	14	7	8	8	2	0	76
	% dentro de edad	50,00%	3,30%	30,60%	10,00%	33,30%	21,90%	23,30%	41,20%	44,40%	19,50%	20,00%	0,00%	
Clima	Recuento	0	0	0	1	0	0	2	0	2	6	1	0	12
	% dentro de edad	0,00%	0,00%	0,00%	3,30%	0,00%	0,00%	3,30%	0,00%	11,10%	14,60%	10,00%	0,00%	
Político	Recuento	0	0	0	0	0	0	0	0	0	3	0	0	3
	% dentro de edad	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	7,30%	0,00%	0,00%	
Social	Recuento	0	2	5	1	0	4	10	0	2	11	3	1	39
	% dentro de edad	0,00%	6,70%	8,10%	3,30%	0,00%	12,50%	16,70%	0,00%	11,10%	26,80%	30,00%	50,00%	
Volcan	Recuento	0	0	0	2	0	0	0	1	0	0	0	0	3
	% dentro de edad	0,00%	0,00%	0,00%	6,70%	0,00%	0,00%	0,00%	5,90%	0,00%	0,00%	0,00%	0,00%	
Accidentes	Recuento	0	1	3	1	0	0	1	0	0	0	0	0	6
	% dentro de edad	0,00%	3,30%	4,80%	3,30%	0,00%	0,00%	1,70%	0,00%	0,00%	0,00%	0,00%	0,00%	
Conflictos entre localidades	Recuento	0	0	0	0	0	1	2	0	0	0	0	0	3
	% dentro de edad	0,00%	0,00%	0,00%	0,00%	0,00%	3,10%	3,30%	0,00%	0,00%	0,00%	0,00%	0,00%	
Falta Infraestructuras	Recuento	0	1	1	2	1	4	11	4	4	8	4	1	41
	% dentro de edad	0,00%	3,30%	1,60%	6,70%	6,70%	12,50%	18,30%	23,50%	22,20%	19,50%	40,00%	50,00%	
Infraestructuras	Recuento	1	2	1	1	1	3	6	1	0	0	0	0	16
	% dentro de edad	25,00%	6,70%	1,60%	3,30%	6,70%	9,40%	10,00%	5,90%	0,00%	0,00%	0,00%	0,00%	
Punto Geográfico	Recuento	0	0	3	1	1	2	2	0	0	0	0	0	9
	% dentro de edad	0,00%	0,00%	4,80%	3,30%	6,70%	6,30%	3,30%	0,00%	0,00%	0,00%	0,00%	0,00%	
Seguridad	Recuento	0	0	0	0	0	0	0	0	0	3	0	0	3
	% dentro de edad	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	7,30%	0,00%	0,00%	
Cultural	Recuento	0	0	1	2	0	1	1	1	0	0	0	0	6
	% dentro de edad	0,00%	0,00%	1,60%	6,70%	0,00%	3,10%	1,70%	5,90%	0,00%	0,00%	0,00%	0,00%	
Total	Recuento	4	30	62	30	15	32	60	17	18	41	10	2	321

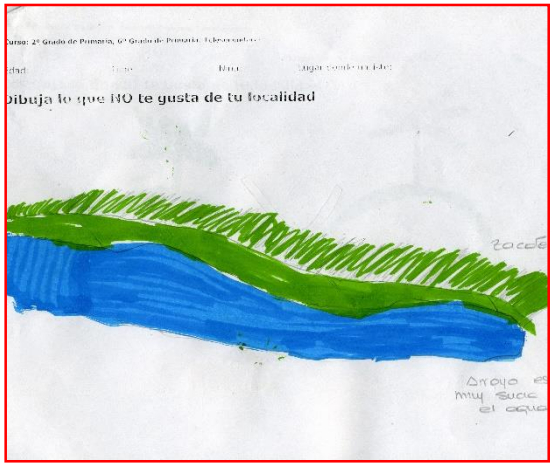
INTERPRETATION OF SOCIO-ENVIRONMENTAL PERCEPTIONS

Dislikes: age

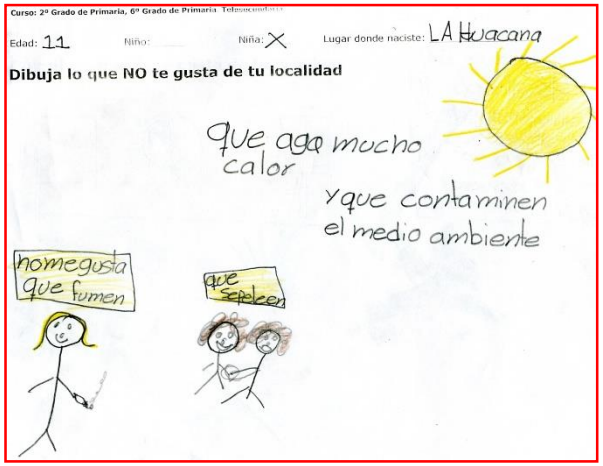
Girl (6 years old), Agua Blanca



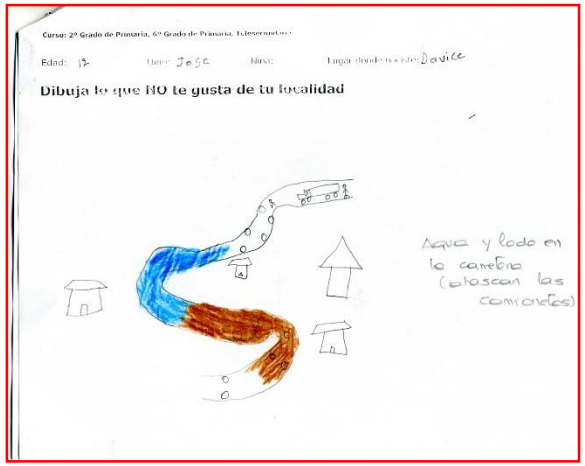
Girl (6 years old), Los Copales



Boy (9 years old), Las Caràmicuas



Girl (11 years old), La Huacana



Boy (12 years), David C. Manjarrez

Boy (12 years old), Mata de Plátano

Illegal logging

Preferences: educational level

Preferencias		Grado							Total
		1º Primaria	2º Primaria	3º Primaria	4º Primaria	5º Primaria	6º Primaria	3º Secundaria	
Naturaleza	Recuento	19	37	10	13	13	31	30	153
	% dentro de grado	57,60%	31,40%	37,00%	54,20%	40,60%	30,40%	42,30%	
Personal	Recuento	10	39	10	4	5	5	1	74
	% dentro de grado	30,30%	33,10%	37,00%	16,70%	15,60%	4,90%	1,40%	
Animales ponzoñosos	Recuento	0	2	1	0	2	0	0	5
	% dentro de grado	0,00%	1,70%	3,70%	0,00%	6,30%	0,00%	0,00%	
Clima	Recuento	2	0	0	0	0	0	12	14
	% dentro de grado	6,10%	0,00%	0,00%	0,00%	0,00%	0,00%	16,90%	
Religión	Recuento	0	2	0	0	0	10	0	12
	% dentro de grado	0,00%	1,70%	0,00%	0,00%	0,00%	9,80%	0,00%	
Social	Recuento	0	0	0	0	0	0	2	2
	% dentro de grado	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	2,80%	
Volcan	Recuento	0	11	2	0	0	10	7	30
	% dentro de grado	0,00%	9,30%	7,40%	0,00%	0,00%	9,80%	9,90%	
Localidad	Recuento	0	0	0	0	0	0	5	5
	% dentro de grado	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	7,00%	
Falta Infraestructuras	Recuento	0	1	0	0	0	0	1	2
	% dentro de grado	0,00%	0,80%	0,00%	0,00%	0,00%	0,00%	1,40%	
Infraestructuras	Recuento	1	24	4	7	11	45	7	99
	% dentro de grado	3,00%	20,30%	14,80%	29,20%	34,40%	44,10%	9,90%	
Punto Geográfico	Recuento	1	1	0	0	1	1	2	6
	% dentro de grado	3,00%	0,80%	0,00%	0,00%	3,10%	1,00%	2,80%	
Seguridad	Recuento	0	0	0	0	0	0	1	1
	% dentro de grado	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	1,40%	
Cultural	Recuento	0	1	0	0	0	0	3	4
	% dentro de grado	0,00%	0,80%	0,00%	0,00%	0,00%	0,00%	4,20%	
Total	Recuento	33	118	27	24	32	102	71	407

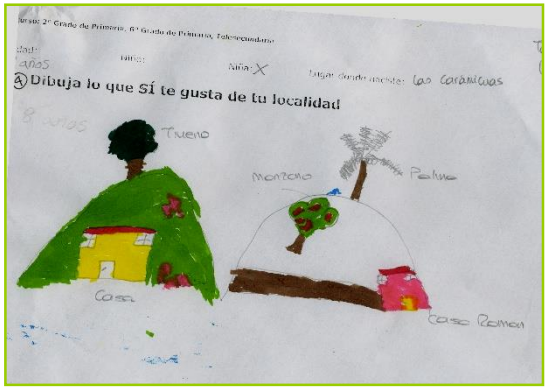
INTERPRETATION OF SOCIO-ENVIRONMENTAL PERCEPTIONS

Dislike: educational level

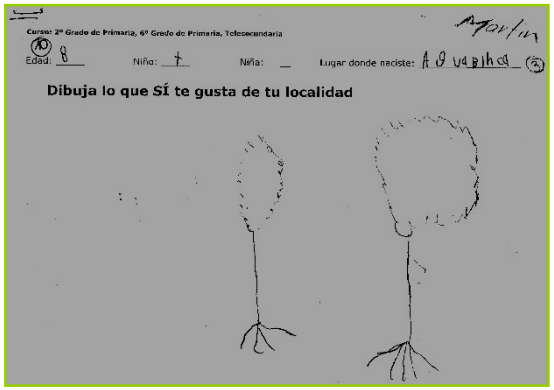
Deficiencias		Grado							Total
		1º Primaria	2º Primaria	3º Primaria	4º Primaria	5º Primaria	6º Primaria	3º Secundaria	
Naturaleza	Recuento	1	10	5	3	1	0	0	20
	% dentro de grado	4,30%	11,20%	21,70%	15,80%	3,80%	0,00%	0,00%	
Personal	Recuento	5	12	1	0	1	4	0	23
	% dentro de grado	21,70%	13,50%	4,30%	0,00%	3,80%	5,00%	0,00%	
Animales ponzoñosos	Recuento	10	23	7	5	8	7	1	61
	% dentro de grado	43,50%	25,80%	30,40%	26,30%	30,80%	8,80%	1,60%	
Ambiental	Recuento	3	22	3	5	4	23	16	76
	% dentro de grado	13,00%	24,70%	13,00%	26,30%	15,40%	28,80%	26,20%	
Clima	Recuento	0	0	1	0	1	1	9	12
	% dentro de grado	0,00%	0,00%	4,30%	0,00%	3,80%	1,30%	14,80%	
Político	Recuento	0	0	0	0	0	0	3	3
	% dentro de grado	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	4,90%	
Social	Recuento	0	8	0	2	1	13	15	39
	% dentro de grado	0,00%	9,00%	0,00%	10,50%	3,80%	16,30%	24,60%	
Volcan	Recuento	0	0	2	0	0	1	0	3
	% dentro de grado	0,00%	0,00%	8,70%	0,00%	0,00%	1,30%	0,00%	
Accidentes	Recuento	2	3	0	0	0	1	0	6
	% dentro de grado	8,70%	3,40%	0,00%	0,00%	0,00%	1,30%	0,00%	
Conflicto entre localidades	Recuento	0	0	0	0	3	0	0	3
	% dentro de grado	0,00%	0,00%	0,00%	0,00%	11,50%	0,00%	0,00%	
Falta Infraestructuras	Recuento	1	2	1	2	1	20	14	41
	% dentro de grado	4,30%	2,20%	4,30%	10,50%	3,80%	25,00%	23,00%	
Infraestructuras	Recuento	1	3	2	1	3	6	0	16
	% dentro de grado	4,30%	3,40%	8,70%	5,30%	11,50%	7,50%	0,00%	
Punto Geográfico	Recuento	0	4	0	1	0	4	0	9
	% dentro de grado	0,00%	4,50%	0,00%	5,30%	0,00%	5,00%	0,00%	
Seguridad	Recuento	0	0	0	0	0	0	3	3
	% dentro de grado	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	4,90%	
Cultural	Recuento	0	2	1	0	3	0	0	6
	% dentro de grado	0,00%	2,20%	4,30%	0,00%	11,50%	0,00%	0,00%	
Total	Recuento	23	89	23	19	26	80	61	321

Preferences: sex

Nature – Infrastructure - Personal – Volcano



Girl (8 years old), Las Carámicuas



Boy (8 years old), Agua Blanca

Preferencias		Género		Total
		Masculino	Femenino	
Naturaleza	Recuento	66	87	153
	% dentro de género	35,30%	39,50%	
Personal	Recuento	32	42	74
	% dentro de género	17,10%	19,10%	
Animales ponzoñosos	Recuento	2	3	5
	% dentro de género	1,10%	1,40%	
Clima	Recuento	5	9	14
	% dentro de género	2,70%	4,10%	
Religión	Recuento	5	7	12
	% dentro de género	2,70%	3,20%	
Social	Recuento	1	1	2
	% dentro de género	0,50%	0,50%	
Volcan	Recuento	14	16	30
	% dentro de género	7,50%	7,30%	
Localidad	Recuento	2	3	5
	% dentro de género	1,10%	1,40%	
Falta Infraestruturas	Recuento	1	1	2
	% dentro de género	0,50%	0,50%	
Infraestructuras	Recuento	55	44	99
	% dentro de género	29,40%	20,00%	
Punto Geográfico	Recuento	2	4	6
	% dentro de género	1,10%	1,80%	
Seguridad	Recuento	1	0	1
	% dentro de género	0,50%	0,00%	
Cultural	Recuento	1	3	4
	% dentro de género	0,50%	1,40%	
Total	Recuento	187	220	407

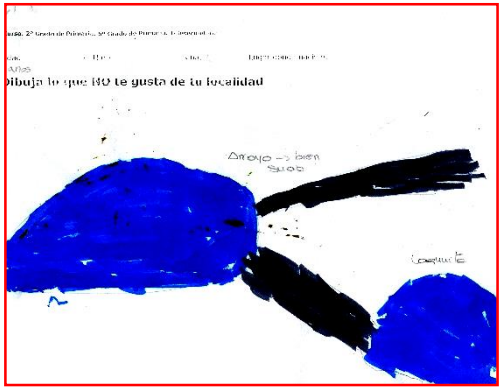
INTERPRETATION OF SOCIO-ENVIRONMENTAL PERCEPTIONS

Dislike: sex

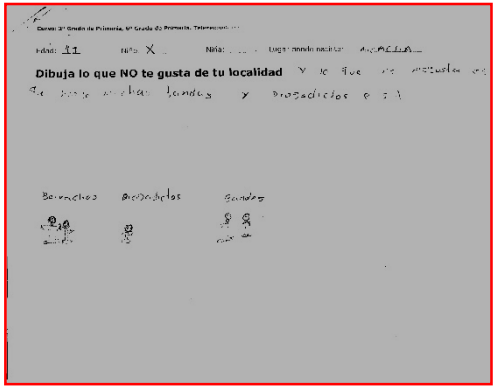
Environmental quality – Poisonous animals

Girls: Lack of infrastructure

Boys: Social



Girl (8 years old), Las Carámicuas



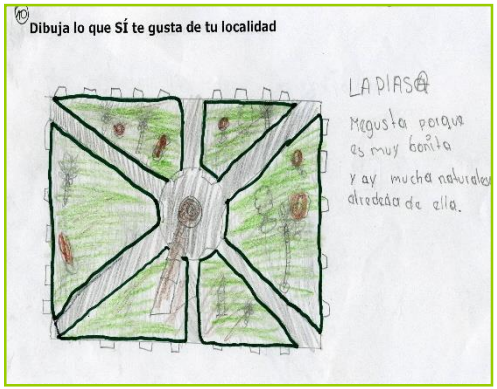
Boy (11 years old), La Huacana

Deficiencias		Género		Total
		Masculino	Femenino	
Naturaleza	Recuento	9	11	20
	% dentro de género	6,10%	6,40%	
Personal	Recuento	14	9	23
	% dentro de género	9,50%	5,20%	
Animales ponzoñosos	Recuento	28	33	61
	% dentro de género	18,90%	19,10%	
Ambiental	Recuento	38	38	76
	% dentro de género	25,70%	22,00%	
Clima	Recuento	4	8	12
	% dentro de género	2,70%	4,60%	
Político	Recuento	0	3	3
	% dentro de género	0,00%	1,70%	
Social	Recuento	16	23	39
	% dentro de género	10,80%	13,30%	
Volcan	Recuento	2	1	3
	% dentro de género	1,40%	0,60%	
Accidentes	Recuento	3	3	6
	% dentro de género	2,00%	1,70%	
Conflicto entre localidades	Recuento	0	3	3
	% dentro de género	0,00%	1,70%	
Falta Infraestructuras	Recuento	14	27	41
	% dentro de género	9,50%	15,60%	
Infraestructuras	Recuento	7	9	16
	% dentro de género	4,70%	5,20%	
Punto Geográfico	Recuento	8	1	9
	% dentro de género	5,40%	0,60%	
Seguridad	Recuento	3	0	3
	% dentro de género	2,00%	0,00%	
Cultural	Recuento	2	4	6
	% dentro de género	1,40%	2,30%	
Total	Recuento	148	173	321

Preferences: rural or urban context

Preferencias		Contexto		Total
		Rural	Urbano	
Naturaleza	Recuento	134	19	153
	% dentro de contexto	42,80%	20,20%	
Personal	Recuento	69	5	74
	% dentro de contexto	22,00%	5,30%	
Animales ponzoñosos	Recuento	5	0	5
	% dentro de contexto	1,60%	0,00%	
Clima	Recuento	14	0	14
	% dentro de contexto	4,50%	0,00%	
Religión	Recuento	5	7	12
	% dentro de contexto	1,60%	7,40%	
Social	Recuento	2	0	2
	% dentro de contexto	0,60%	0,00%	
Volcán	Recuento	29	1	30
	% dentro de contexto	9,30%	1,10%	
Localidad	Recuento	1	4	5
	% dentro de contexto	0,30%	4,30%	
Falta Infraestructuras	Recuento	1	1	2
	% dentro de contexto	0,30%	1,10%	
Infraestructuras	Recuento	48	51	99
	% dentro de contexto	15,30%	54,30%	
Punto Geográfico	Recuento	2	4	6
	% dentro de contexto	0,60%	4,30%	
Seguridad	Recuento	1	0	1
	% dentro de contexto	0,30%	0,00%	
Cultural	Recuento	2	2	4
	% dentro de contexto	0,60%	2,10%	
Total	Recuento	313	94	407

Girl (6 years old), Puerta de la Playa

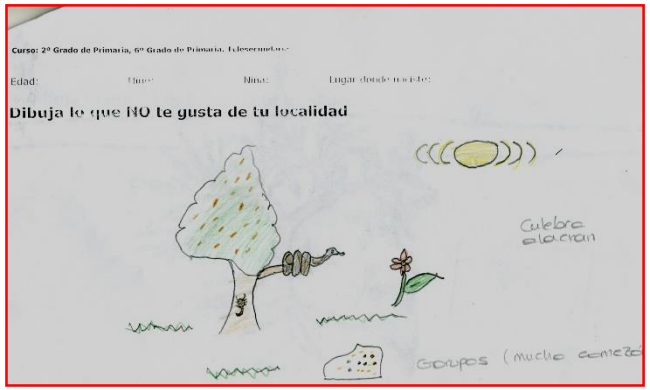


Girl (11 years old), La Huacana

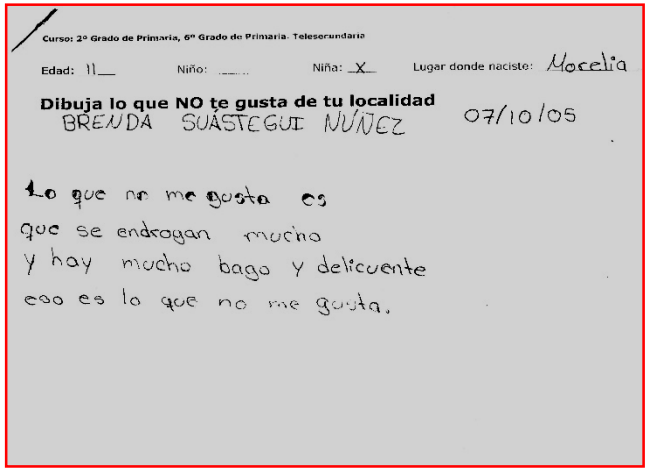
INTERPRETATION OF SOCIO-ENVIRONMENTAL PERCEPTIONS

Dislikes: rural or urban context

Deficiencias		Contexto		Total
		Rural	Urbano	
Naturaleza	Recuento	19	1	20
	% dentro de contexto	8,00%	1,20%	
Personal	Recuento	19	4	23
	% dentro de contexto	8,00%	4,80%	
Animales ponzoñosos	Recuento	57	4	61
	% dentro de contexto	24,10%	4,80%	
Ambiental	Recuento	56	20	76
	% dentro de contexto	23,60%	23,80%	
Clima	Recuento	4	8	12
	% dentro de contexto	1,70%	9,50%	
Político	Recuento	0	3	3
	% dentro de contexto	0,00%	3,60%	
Social	Recuento	14	25	39
	% dentro de contexto	5,90%	29,80%	
Volcan	Recuento	3	0	3
	% dentro de contexto	1,30%	0,00%	
Accidentes	Recuento	6	0	6
	% dentro de contexto	2,50%	0,00%	
Conflicto entre localidades	Recuento	3	0	3
	% dentro de contexto	1,30%	0,00%	
Falta Infraestructuras	Recuento	35	6	41
	% dentro de contexto	14,80%	7,10%	
Infraestructuras	Recuento	13	3	16
	% dentro de contexto	5,50%	3,60%	
Punto Geográfico	Recuento	2	7	9
	% dentro de contexto	0,80%	8,30%	
Seguridad	Recuento	0	3	3
	% dentro de contexto	0,00%	3,60%	
Cultural	Recuento	6	0	6
	% dentro de contexto	2,50%	0,00%	
Total	Recuento	237	84	321



Girl (11 years old), Las Carámicuas



Girl (11 years old), La Huacana

Discussion

Preferences:

Nature is most frequently mentioned as a positive category (*biophilia*)

In some cases *Nature* is seen as a negative category (*zacate*)

Infrastructure is also mentioned frequently

in rural Context: school

in urban Context: municipal plaza (square)

Personal is the 3rd most frequent category (*topophilia*)

Dislikes

Environmental Quality is the most frequent category

Rural **Context**: refers to the bad quality of river water (poor drainage)

Urban **Context**: river water quality and urban solid waste problems.

Poisonous *Animals* is also frequent (snakes & scorpions)

Poor Infrastructure is especially important in communities with poor road connections.

Social is especially relevant only in the main community of La Huacana, and in 2 communities which have water supply conflicts (Naranjo de Jorullo & Los Copales).

Links between school and locality

To make these research results know to different social groups: local government, teachers, children, teenagers, local people,…

The present research results could be useful to design collective actions between the school and its locality.

To promote new transformation processes in the social system in order to overcome the increasing social and communal lack of responsibility, one of the main problems identified by the teenagers.

To connect educational and social processes (school and life, curriculum and the real world…) in order to create specific projects adapted to resources, needs and individual realities.

To promote the participation of the school in the design of plans and programs that affects to the development of the locality.

To help teachers to identify problematic situations related with children and teenagers' natural and social context.

Returning the drawings to the children

Puerta de la Playa

Agua Blanca

Joya de Álvarez

Los Copales

David C. Manjarrez

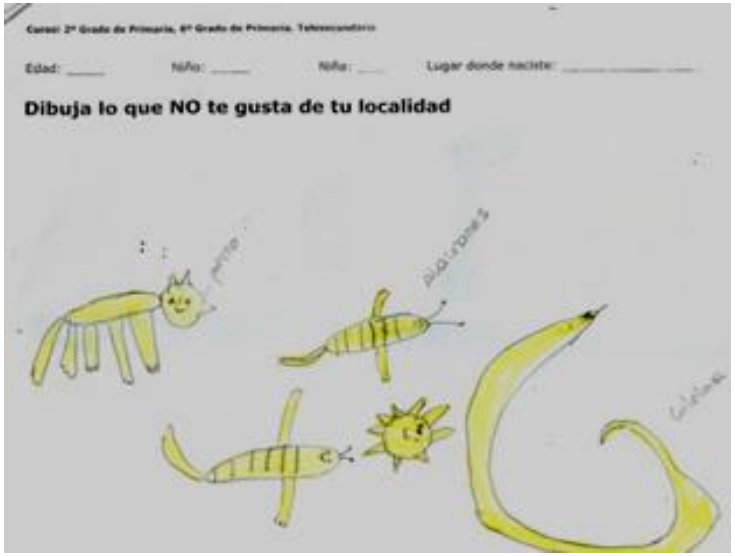
Mata de Plátano

Incorporating the socio-environmental dimension in the curriculum

To properly value children's and teenagers's knowledge in order to adapt the education system to the real situations, according to one of the basic principles of environmental education: to deal with children's and teenagers' problems in an integrated and holistic way.

To make the research results known to primary and secondary school teachers in order to generate reflections on environmental and ecological and social theories and to design environmental education programs focused on solving the main socio-environmental problems as identified by the children.

Example: Poisonous animals



Chapter 10
Drawing Analysis: Tools for Understanding Children's Perceptions of Community Conservation

Roser Maneja-Zaragoza, Diego Varga Linde, and Martí Boada Juncà

Introduction

There is a growing consensus among scholars that children have an awareness of, and are capable of participating in, social, political, and economic issues in their town or community [1, 2]. From experiences in both urban and rural contexts, the benefits derived from the incorporation of children in decision-making processes on natural resource management in their communities are multiple. They include, among others, promoting their personal development and sense of belonging to the community, helping create a new model of leadership for participation and democracy, and valuing contributions young citizens can make in community administration and local government. Finally, and as stated in the Tbilisi Environmental Education Declaration in 1977, including young people in decision-making promotes their civic commitment through a democratic and participatory process including discussions, identification and definition of problems and priorities. Encouraging children's participation in the development of their own community fosters learning of formal techniques for participation in a democratic society, and the acquisition of lasting habits and interests of an environmental character. In addition, because children are able to graphically represent areas where adults very rarely go, they can contribute to the improvement of those places through their experience as users of and adventurers in these environments [3].

While the reasons for it are evident, the question of *how* to include children's preferences in local decision-making processes on environmental issues remains. The inclusion of children in decision-making processes represents a new frontier in

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L. Porter-Bolland et al. (eds.), *Community Action for Conservation: Mexican Experiences*, 159
DOI 10.1007/978-1-4614-7956-7_10, © Springer Science+Business Media New York 2013

ARTÍCULOS

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Percepciones socioambientales infantiles y adolescentes. Propuestas de educación ambiental. La Huacana (Michoacán, México)

Children and Teenagers' Socioecological Perceptions. Environmental Education Proposals. La Huacana (Michoacán, México)

Roser MANEJA ZARAGOZA, Martí BOADA,
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Universidad Nacional Autónoma de México, México.
International Institute for Geo-Information Science and Earth Observation (ITC), Enschede, Netherlands.

RESUMEN

El desarrollo de nuevos enfoques en educación ambiental y el uso de metodologías innovadoras pueden contribuir a mejorar el conocimiento de los intereses sociales y las percepciones relativas al entorno. En el presente estudio se han utilizado dibujos, cuestionarios y el uso de Sistemas de Información Geográfica Participativo para obtener las percepciones socioecológicas de los jóvenes y adolescentes en relación a su propia comunidad, con el objetivo de formular propuestas de implementación en los procesos educativos y de toma de decisiones a nivel local y regional. El área de estudio se localiza en el municipio de La Huacana, en el estado de Michoacán (México). La muestra está formada por 284 alumnos de educación primaria y secundaria, de edades comprendidas entre los 5 y los 17 años, los cuales residen en pequeñas comunidades rurales alrededor del Área Natural Protegida Vol-

ABSTRACT

The development of new approaches in environmental education and the use of innovative methodologies may improve knowledge of social interests and perceptions regarding the environment. In the present study, drawings, questionnaires and use of the Participatory Global Positioning System (P-GPS) were included to obtain the socio-ecological perceptions of children and teenagers regarding their own community, in order to formulate implementation proposals related to educational and decision-making processes in a regional and local context. The area of study is located in the municipality of La Huacana, in the State of Michoacán (México). The sample consists of 284 pupils from elementary and secondary schools, ages 5 to 17, living in small rural villages around the Natural Protected Area of Volcán el Jorullo (the Jorullo Volcano). Results obtained through statistical analysis show

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Case study 2. Drawing as an empowering tool for children and youth: Tizirt case study

Master's in Interdisciplinary Studies in Environmental, Economic and Social Sustainability

Major in Science and Management of Global Change

Verónica Vallejo Sancho

Supervisor: Dr. Roser Maneja Zaragoza

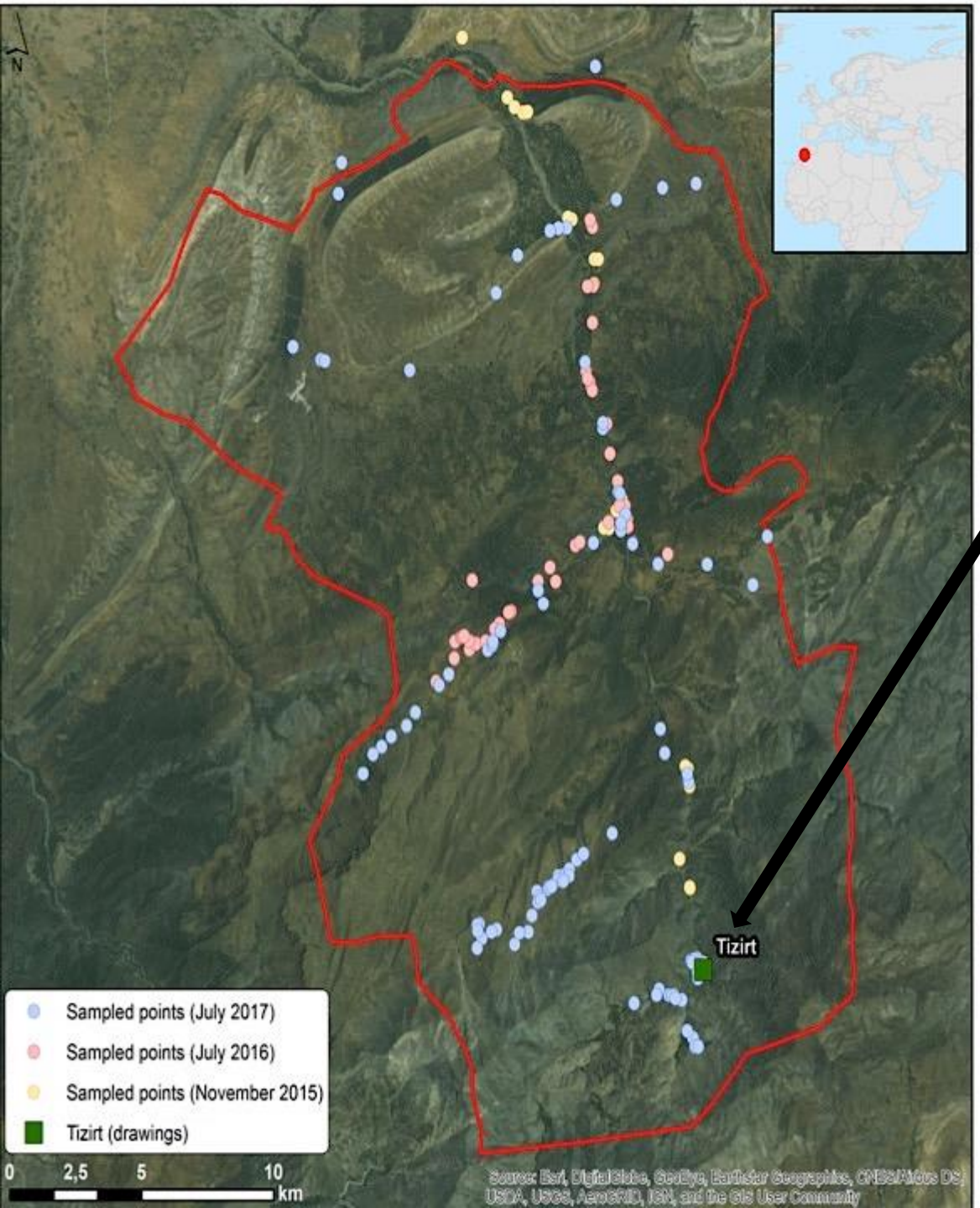
Barcelona, September 7, 2018

Objectives

- Analyze children’s and youth perception of their environment
- Incorporating children's perception of the environment in decision-making processes
- Through the use of drawings, the children identify and define what are their preferences and deficiencies

Objectives

- Treat children as social actors
- Active members in the construction and determination of their own social lives
- Not just passive subjects
- Consider their thoughts, concerns, perceptions, understanding and knowledge
- Powerful vehicle for social transformation' (Driscкell, 2002)



Study Area
Tizirt

Figure 1: Zat Valley map and within Tizirt.
Source: (Costa Ribes 2018)

Study Area

- Tizirt community -Zat Valley, High Atlas (Morocco)
- Continental climate with extreme weather, 5°C in winter and 36°C in summer
- Amazigh people are the predominant settlement
- 23.000 inhabitants
- Agricultural based economy
- Natural resources dependent for survival
- 50% of children and youth of 0-24 years

Methodology

- Preferences: What do you like about where you live?
- Deficiencies: What do you not like about where you live?
- Interpret and describe their drawings to the interviewers
- Extraction of keywords
- Division in categories
- Statistical analysis

Figure 2, 3 and 4: Children and youth drawing their preferences and deficiencies at Tizirt school.
Taken by: (Schmid 2018)

Figure 5 and 6: Girl explaining her drawing in Amazigh and simultaneous translation from Amazigh to French, to obtain the keywords which later were translated to English.
Taken by: (Romera 2018)

Preferences (positives)			
Categories	**Description**	**Key words**	**Number**
Biotic Factors	Includes all biotic factors, living elements, biodiversity (fauna and flora)	Nature, trees (fruit trees, walnut tree, forest, palm grove, tree roots, and fig), flowers, animals, butterflies, etc.	68
Abiotic Factors	Includes all abiotic factors, non-living elements, referring to climatic and weather elements	Oxygen, atmosphere, sky, earth, sun, mountains, beach, river, water, water tank, spring, summer, good weather	27
Infrastructure	Includes all human-made objects	House, school, city council, home, irrigation, clothes	21
		TOTAL	116

Table 1: Positive categories.
Source: prepared by the author

Deficiencies (negatives)			
Categories	**Description**	**Key words**	**Number**
Natural Hazards	Includes all dangerous animals of their surroundings that bite, are poisonous, or look scary and natural disaster events, floods, storms, etc.	Scorpion, snake, dog, lizard, elephant, donkey, cockroach, snail, frog, turtle, river floods, rain, clouds, storms, lightning, sea, beach, autumn	78
Human Impact	Includes the fear for their lives, being run over and for the contamination	Car pollution and car accidents	8
Unrealistic fear	Includes all fear not based in real dangers for them, mainly influenced by external factors such as TV.	Dinosaurs, darkness and TV cartoon.	5
		TOTAL	91

Table 2: Positive and negative categories.
Source: prepared by the author

Sample

- 32 students of ages 8 to 20
- 13 girls and 19 boys
- Ages 10 and 11 prevail (43.75%)
- Predominance of elementary school students
- Only speak Amazigh

Results Preferences

Figure 7: Preferences drawings

Results Preferences

Preferences		
Category	**Frequency**	**Percentage %**
Biotic factors	68	58,62%
Abiotic factors	27	23,28%
Infrastructure	21	18,10%
Total	**116**	**100,00%**

Table 5: Frequency of positive preferences.
Source: prepared by the author

Age

Preferences		Age											TOTAL
		8	9	10	11	12	13	14	15	16	17	20	
Biotic Factors	Count	3	1	16	15	9	7	10	2	1	3	1	**68**
	Age %	33%	50%	70%	83%	53%	78%	45%	40%	33%	75%	25%	
Abiotic Factors	Count	2	0	1	2	5	1	11	2	1	0	2	**27**
	Age %	22%	0%	4%	11%	29%	11%	50%	40%	33%	0%	50%	
Infrastructure	Count	4	1	6	1	3	1	1	1	1	1	1	**21**
	Age %	44%	50%	26%	6%	18%	11%	5%	20%	33%	25%	25%	
TOTAL		**9**	**2**	**23**	**18**	**17**	**9**	**22**	**5**	**3**	**4**	**4**	**116**

```
          Pearson chi2(20) =  31.9107   Pr = 0.044
likelihood-ratio chi2(20) =  33.6604   Pr = 0.029
```

Table 6: Frequency and percentage of preferences related to age
Source: prepared by the author

Age

Figure 8: 10 year old boy drawing with a clear predominance of biotic factors.

School level

Preferences		School Level										TOTAL
		Elementary school						Middle school			High school	
		1st year	2nd year	3rd year	4th year	5th year	6th year	1st year	2nd year	3rd year	3rd year	
Biotic factors	Count	1	12	7	13	15	11	5	2	1	1	**68**
	Grade %	20%	63 %	70 %	76 %	65 %	48 %	56%	67%	33%	25%	
Abiotic Factors	Count	1	2	0	1	7	10	2	1	1	2	**27**
	Grade %	20%	11 %	0%	6%	30 %	43 %	22%	33%	33%	50%	
Infrastructure	Count	3	5	3	3	1	2	2	0	1	1	**21**
	Grade %	60%	26 %	30 %	18 %	4%	9%	22%	0%	33%	25%	
TOTAL		**5**	**19**	**10**	**17**	**23**	**23**	**9**	**3**	**3**	**4**	**116**

```
         Pearson chi2(18) =  27.1617   Pr = 0.076
likelihood-ratio chi2(18) =  29.9397   Pr = 0.038
```

Table 7: Frequency and percentage of preferences related to education level
Source: prepared by the author

School level

Figure 9 and 10: These detailed drawings from two 5th grader girls include biotic (trees, roots, flowers) and abiotic (sun, water and earth) factors on their drawings.

Gender

Preferences		Gender		TOTAL
		Male	Female	
Biotic Factors	Count	43	25	**68**
	Gender %	57%	63%	
Abiotic Factors	Count	18	9	**27**
	Gender %	24%	23%	
Infrastructure	Count	15	6	**21**
	Gender %	20%	15%	
TOTAL		**76**	**40**	**116**

```
          Pearson chi2(2) =   0.4973   Pr = 0.780
likelihood-ratio chi2(2) =   0.5060   Pr = 0.776
```

Table 8: Frequency and percentage of preferences related to gender
Source: prepared by the author

Results Deficiencies

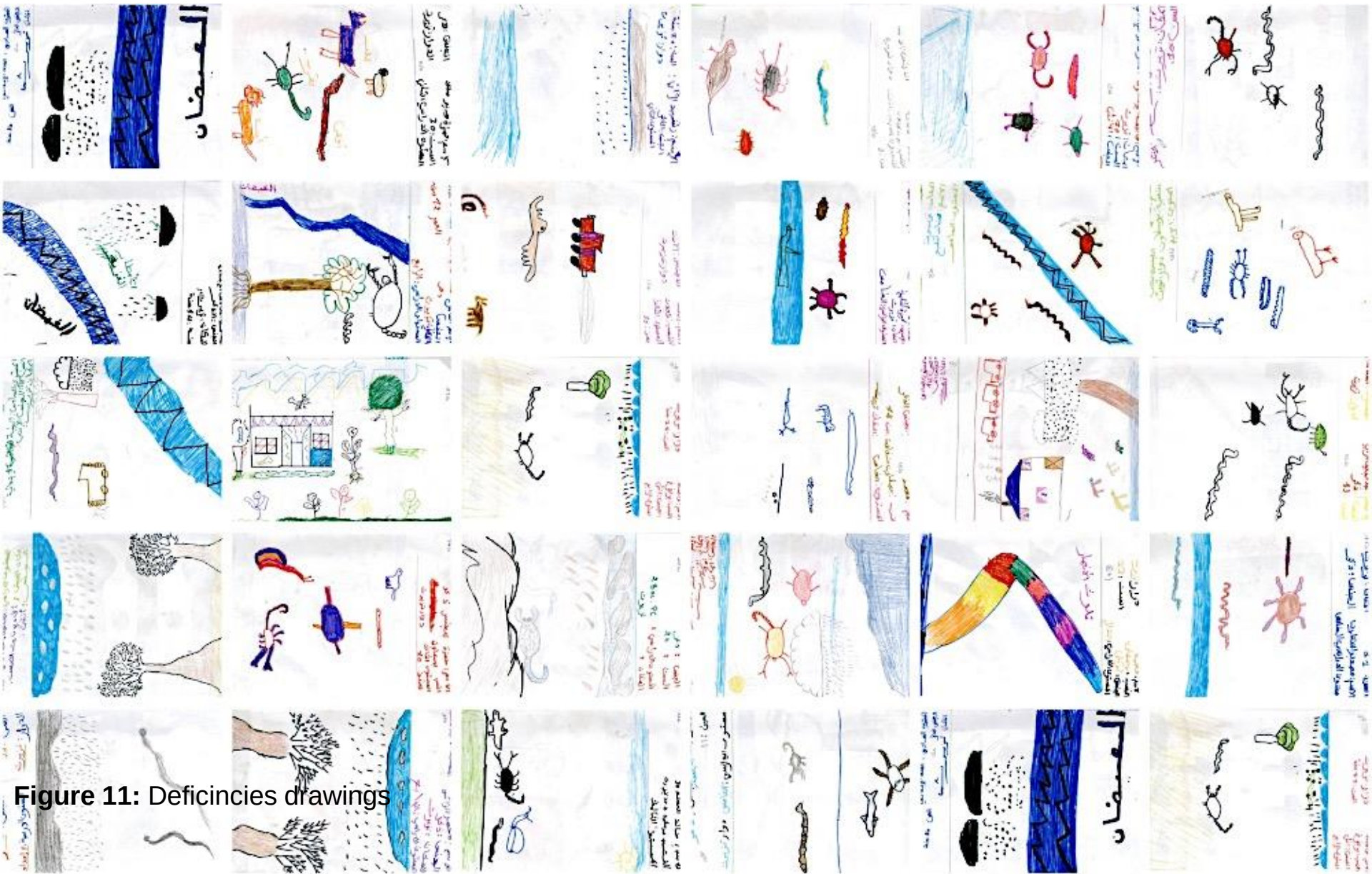


Figure 11: Deficincies drawings

Results Deficiencies

Deficiencies		
Category	**Frequency**	**Percentage %**
Natural Hazards	78	85,71%
Human Impact	5	5,49%
Unrealistic fears	8	8,79%
Total	**91**	**100,00%**

Table 9: Frequency of negative deficiencies.
Source: prepared by the author

Age

Deficiencies		Age									TOTAL
		9	10	11	12	13	14	15	17	20	
Natural Hazards	Count	3	26	14	12	4	8	4	4	3	**78**
	Age %	100%	93%	88%	80%	80%	62%	100%	100%	100%	
Human Impact	Count	0	1	0	0	0	4	0	0	0	**5**
	Age %	0%	4%	0%	0%	0%	31%	0%	0%	0%	
Unrealistic Fears	Count	0	1	2	3	1	1	0	0	0	**8**
	Age %	0%	4%	13%	20%	20%	8%	0%	0%	0%	
TOTAL		**3**	**28**	**16**	**15**	**5**	**13**	**4**	**4**	**3**	**91**

```
          Pearson chi2(16) =  24.7436   Pr = 0.074
likelihood-ratio chi2(16) =  20.3820   Pr = 0.204
```

Table 10: Frequency and percentage of deficiencies related to age
Source: prepared by the author

Age

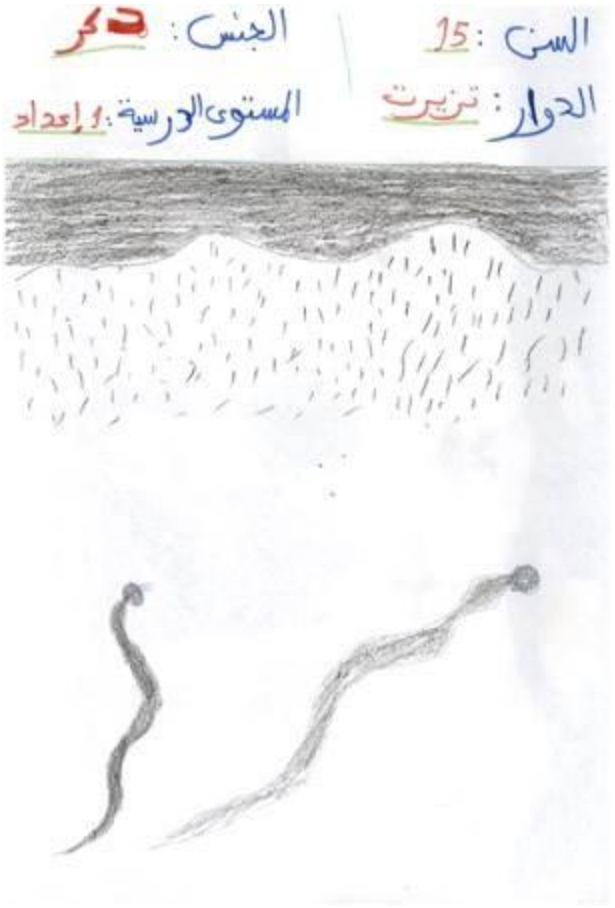


Figure 12 and 13: 10 year old on the left and 15 year old the right both have natural hazard elements on their drawings, represented by dangerous animals and storms.

Grade

Deficiencies		Grade								TOTAL
		Elementary school				Middle school			High school	
		2nd year	3rd year	4th year	5th year	6th year	1st year	2nd year	3rd year	
Natural Hazards	Count	14	15	14	15	7	8	2	3	**78**
	Grade %	93%	94%	88%	79%	64%	100%	67%	100%	
Human Impact	Count	0	1	0	0	4	0	0	0	**5**
	Grade %	0%	6%	0%	0%	36%	0%	0%	0%	
Unrealistic Fears	Count	1	0	2	4	0	0	1	0	**8**
	Grade %	7%	0%	13%	21%	0%	0%	33%	0%	
TOTAL		**15**	**16**	**16**	**19**	**11**	**8**	**3**	**3**	**91**

```
          Pearson chi2(14) =  32.9269   Pr = 0.003
likelihood-ratio chi2(14) =  27.2820   Pr = 0.018
```

Table 11: Frequency and percentage of deficiencies related to education level
Source: prepared by the author

Gender

Deficiencies		Gender		TOTAL
		Male	Female	
Natural Hazards	Count	46	32	**78**
	Gender %	92%	78%	
Human Impact	Count	0	5	**5**
	Gender %	0%	12%	
Unrealistic Fears	Count	4	4	**8**
	Gender %	8%	10%	
TOTAL		**50**	**41**	**91**

Table 12: Frequency and percentage of deficiencies related to gender
Source: prepared by the author

Gender

Figure 12 and 13: Drawing on the left of a 14 year old girl that includes human impact, drawing on the left of a 10 year old boy that only focus on natural hazards.

Discussion

- Preferences main category: biotic factors
- Deficiencies main category: natural hazards
- Environmental elements were predominant in both
- Sample children have the ability to draw realistically, differentiate colors and work with more detail of their surroundings
- School drop outs is a problem in Morocco
- Aesthetic values (flowers, greenness, beauty)

Limitations:

- Language and education system

Conclusion

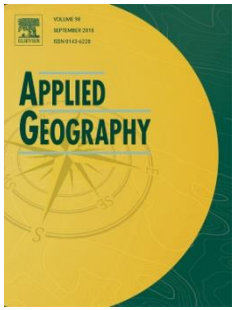
- Enriched understanding of the area
  - children and youth perception
- Promoted children and youth engagement
- Feel like their opinion matter and are valued
- Start point for incorporation of this social actors, towards a social transformation

ase Study 3. Recognizing the local socio-ecological knowledge in the Zat Valley (Morocco) through Participatory Mapping

Master Thesis
Fricka Schmid
Supervisor: Dr. Roser Maneja

Universitat Autònoma de Barcelona – ICTA
07.09.2018

Research Purpose



Research Aim:

- Recognize the socio-ecological knowledge of the local population in the Zat valley in Morocco

Research Questions:

- What are the differences in socio-ecological knowledge between men and women
- How does the local knowledge differ from the scientific perspective of the valley?
- What is the aspiration of the community members for future development?

Hypothesis:

- Participatory Mapping is an appropriate methodology to understand local socio-ecological knowledge

Population and Economy

Socio-ecological Heritage

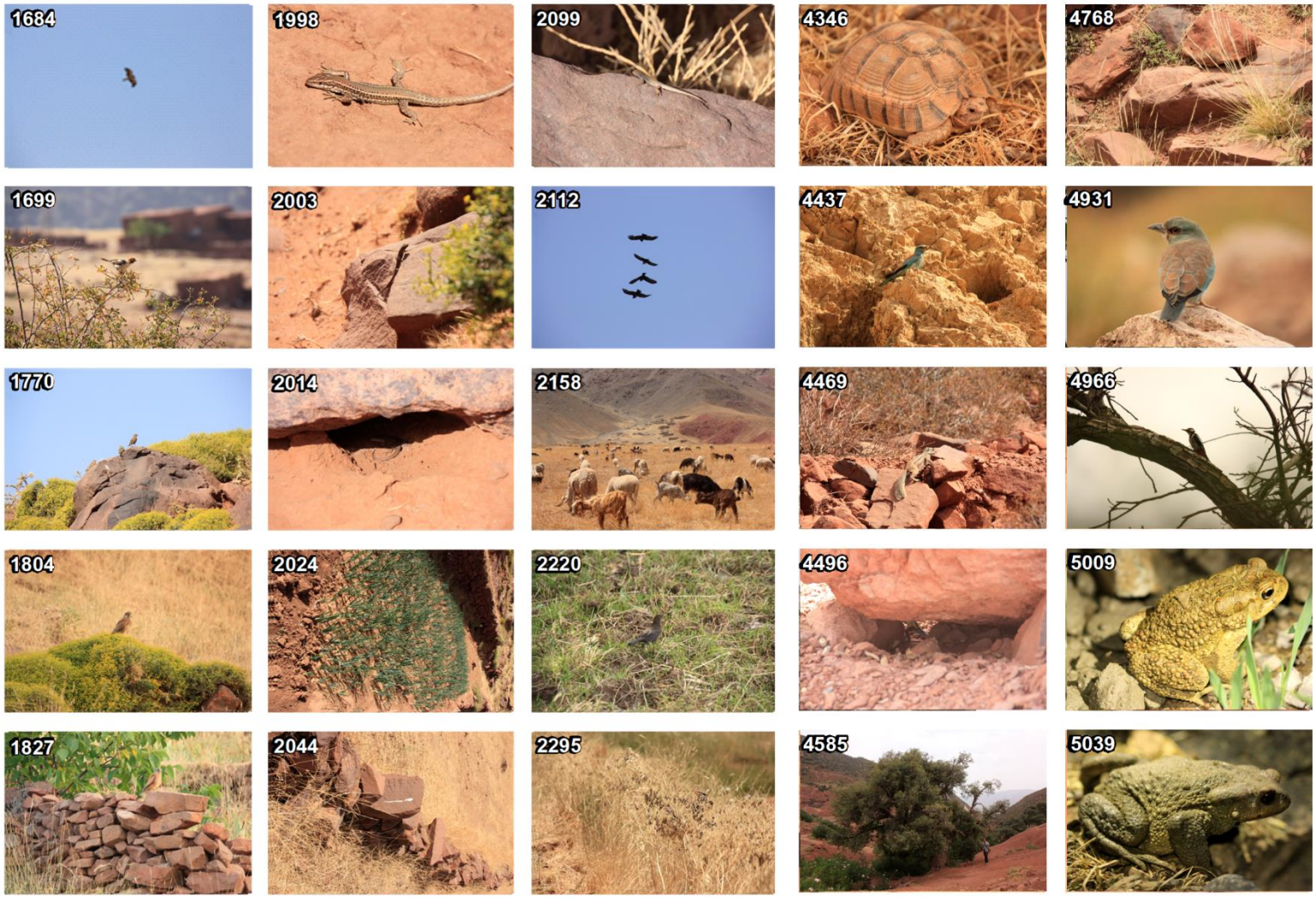
Participatory Mapping Zat Valley

Participatory Mapping with women (left) and men (right)

Participatory Mapping Zat Valley

The orthophoto map

Participatory Mapping Zat Valley



The pictures of relevant flora and fauna

Participatory Mapping Zat Valley

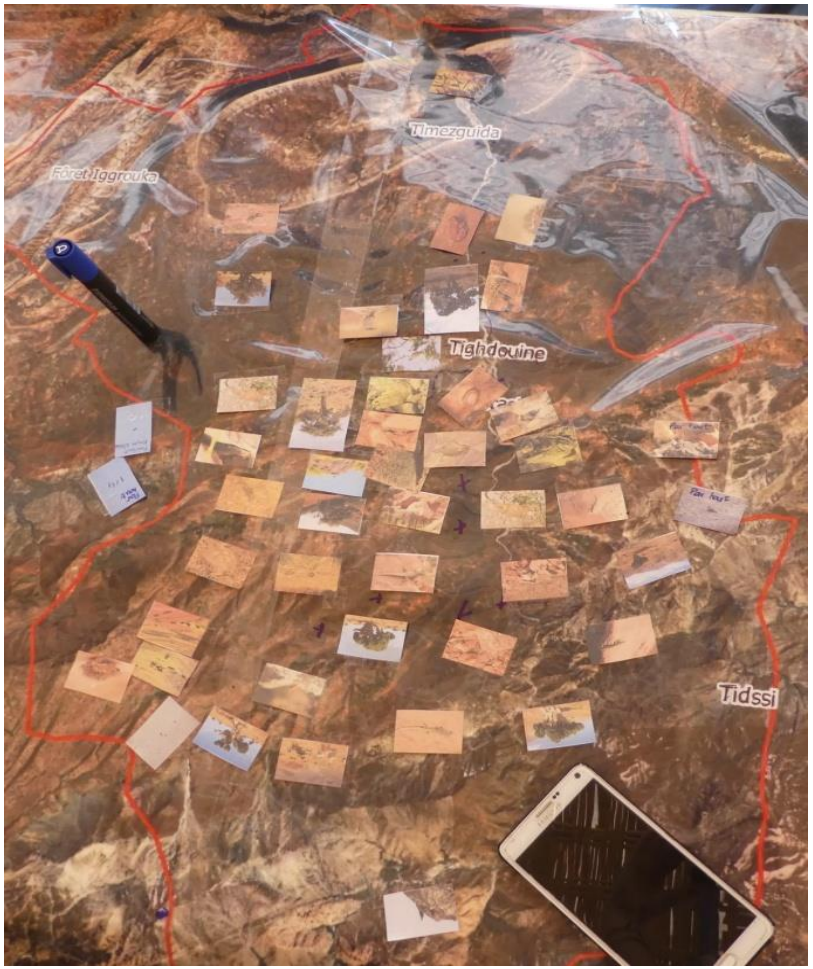
Participatory Mapping with women (left) and men (right)

Sample

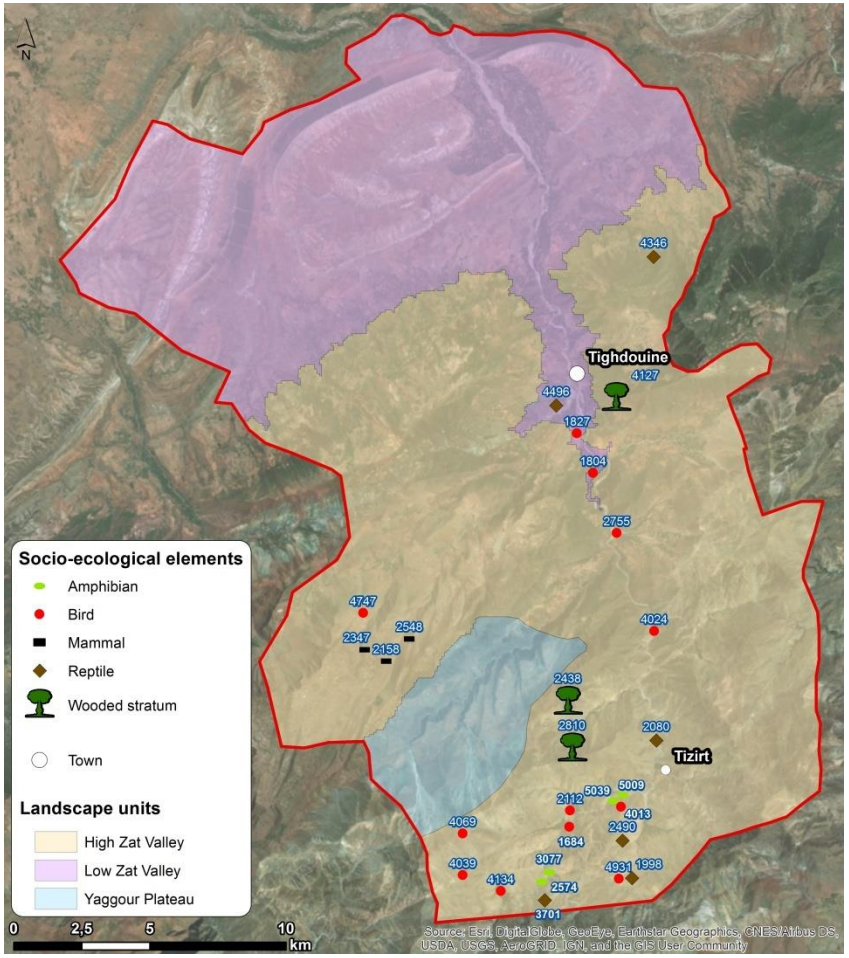
	Age	Gender	Formal Education	Family Status	Residence	Occupation
1	19	Female	Secondary School	Single	Tizirt	Housewife
2	19	Female	Secondary School	Single	Tizirt	Housewife
3	20	Female	Primary School	Single	Tizirt	Housewife
4	~40	Female	None	Married	Tizirt	Housewife
5	~50	Female	None	Widowed	Tizirt	Housewife
6	>50	Female	None	Married	Tizirt	Housewife
7	48	Male	High School	Married	Zaouit	Multiple Activities
8	49	Male	High School	Married	Zaouit	Retailer
9	55	Male	Diploma (civil engineering)	Married	Tighdouine	Public Servant
10	59	Male	Diploma (civil engineering)	Married	Marrakech	Public Servant
11	61	Male	None	Married	Tafoukt	Agriculture
12	83	Male	None	Married	Igdman	Artisan

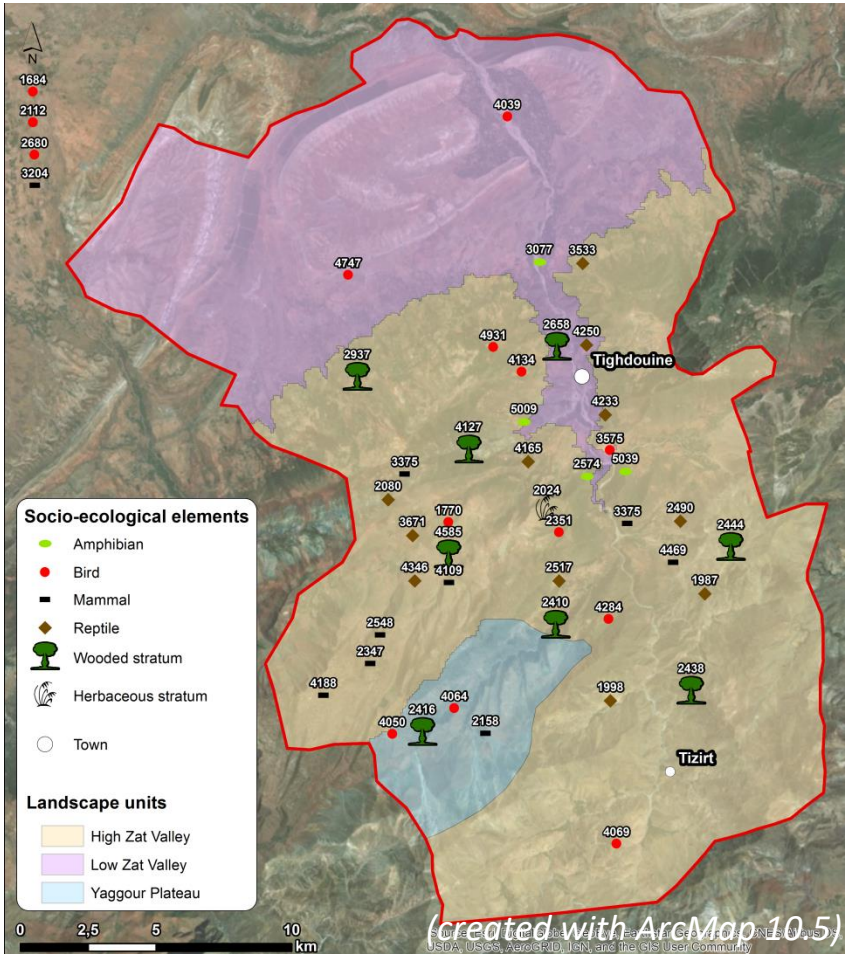
Local Maps


Timezguilda
Tighdouine
Talata
Tidssi

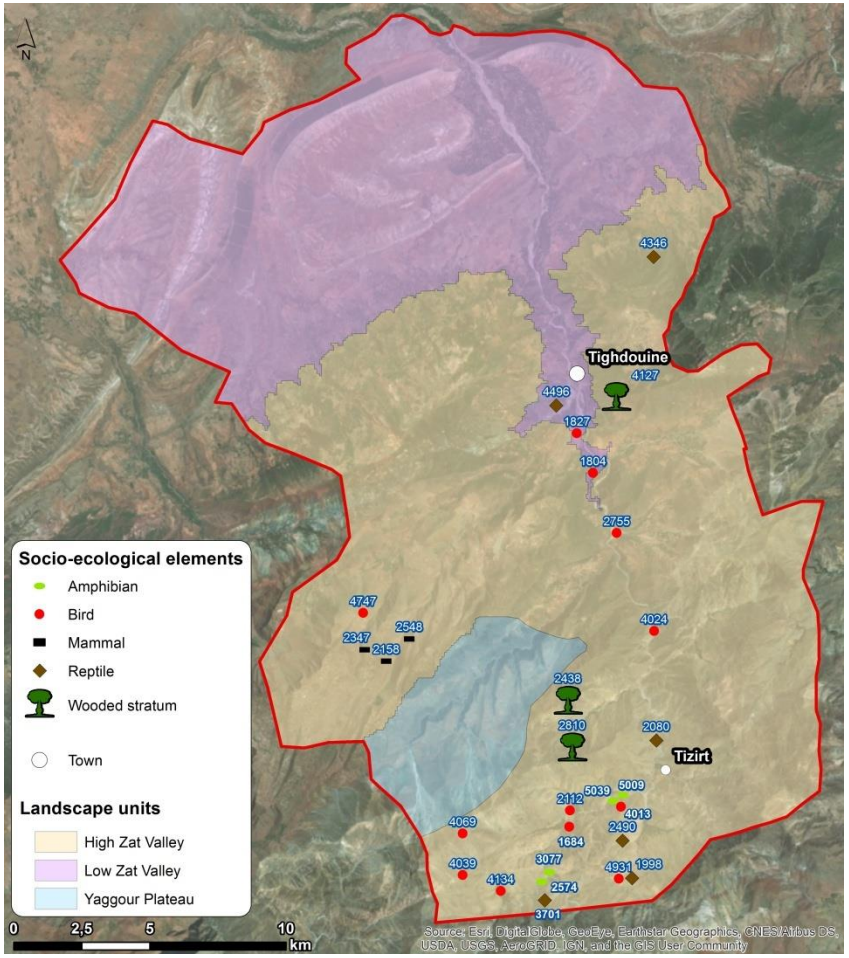

Timezguilda
Tighdouine
Tidssi

ArcMaps


Socio-ecological elements
Amphibian
Bird
Mammal
Reptile
Wooded stratum
Town
Landscape units
High Zat Valley
Low Zat Valley
Yaggour Plateau
Tighdouine
Tizirt
0 2,5 5 10 km


Socio-ecological elements
Amphibian
Bird
Mammal
Reptile
Wooded stratum
Herbaceous stratum
Town
Landscape units
High Zat Valley
Low Zat Valley
Yaggour Plateau
Tighdouine
Tizirt
0 2,5 5 10 km
(created with ArcMap 10.5)

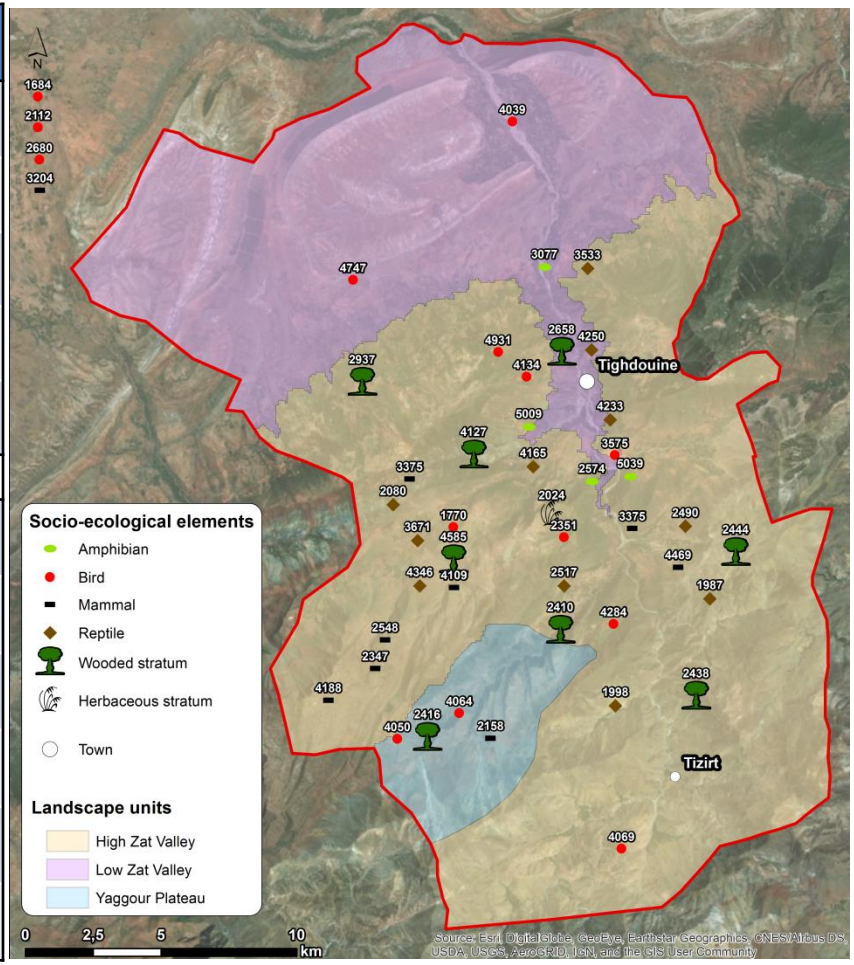
ArcMaps - Women



Located Pictures - Women		
	Total	**28**
	Low Zat	3
	High Zat	25
	Amphibians	4
	Birds	12
	Mammals	3
	Reptiles	6
	Wooded stratum	3

ArcMaps - Men

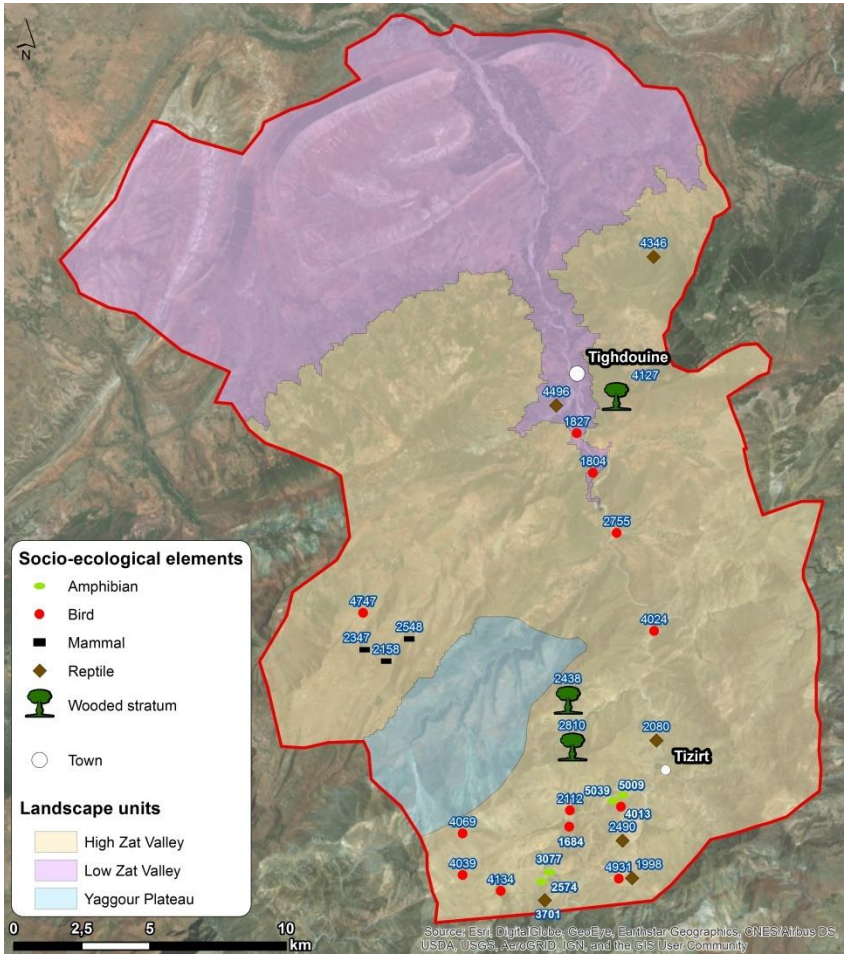
Located Pictures – Men		
	Total	**47**
	Low Zat	8
	High Zat	31
	Yagour Plateau	4
	Entire Valley	4
	Amphibians	4
	Birds	14
	Mammals	9
	Reptiles	11
	Wooded stratum	8
	Herbaceous stratum	1

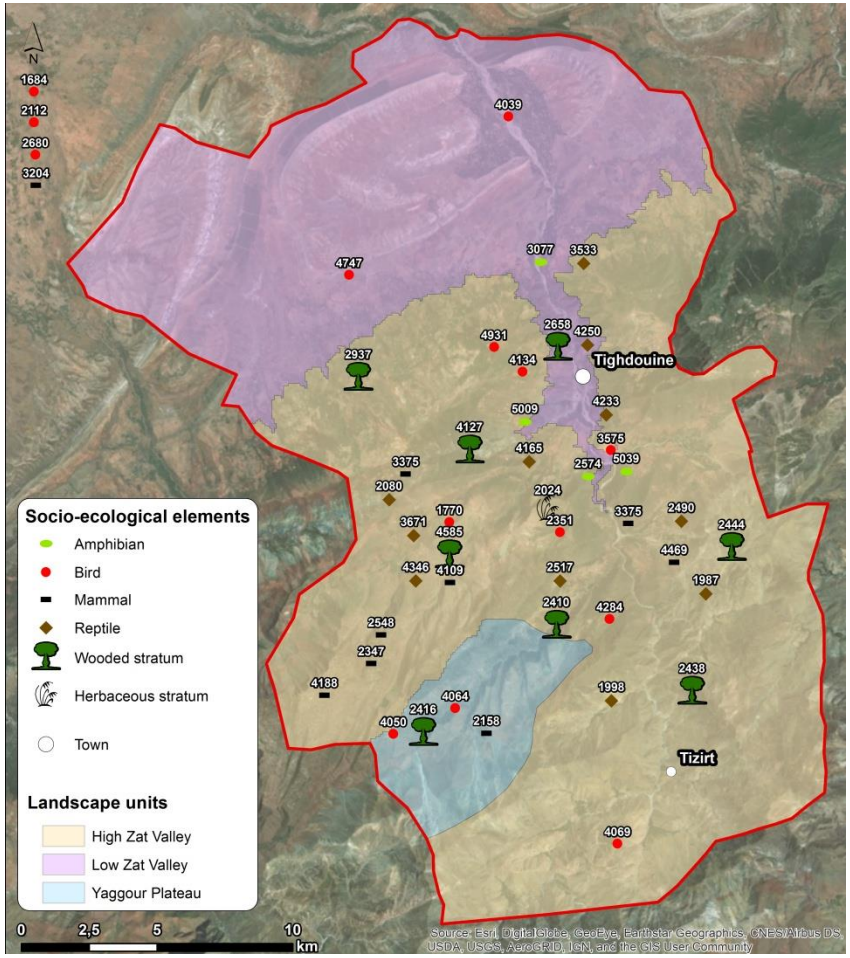


ArcMaps - Comparison

Located Pictures	Men	Women
Total	**47**	**28**
Low Zat	8	3
High Zat	31	25
Yagour Plateau	4	
Entire Valley	4	
Amphibians	4	4
Birds	14	12
Mammals	9	3
Reptiles	11	6
Wooded stratum	8	3
Herbaceous stratum	1	

Gender Comparison





♀ ♂

Gender Comparison ♀♂

- Men recognized more species and wider distribution
  - ➢ Traditional knowledge gendered

    (Voeks, 2007; Camou-Guerrero, et al., 2008; Montanari, 2014; Powell, et al., 2014; Díaz-Reviriego, et al., 2016)
- All women housewives ↔ Men have different occupations
- Male inhabitants spend more time outside and move more
  - ➢ Women and men acquire knowledge through different activities

    (Voeks, 2007; Camou-Guerrero, et al., 2008; Montanari, 2014; Díaz-Reviriego, et al., 2016)
- Effect of age?
  - ➢ Correlation between knowledge and age

    (Begossi, et al., 2002; Voeks, 2007; Gómez-Baggethun, et al., 2010; Díaz-Reviriego, et al., 2016)

Changes in ethnobotanical knowledge among the Waorani indigenous society, Ecuador

Holger Weckmueller

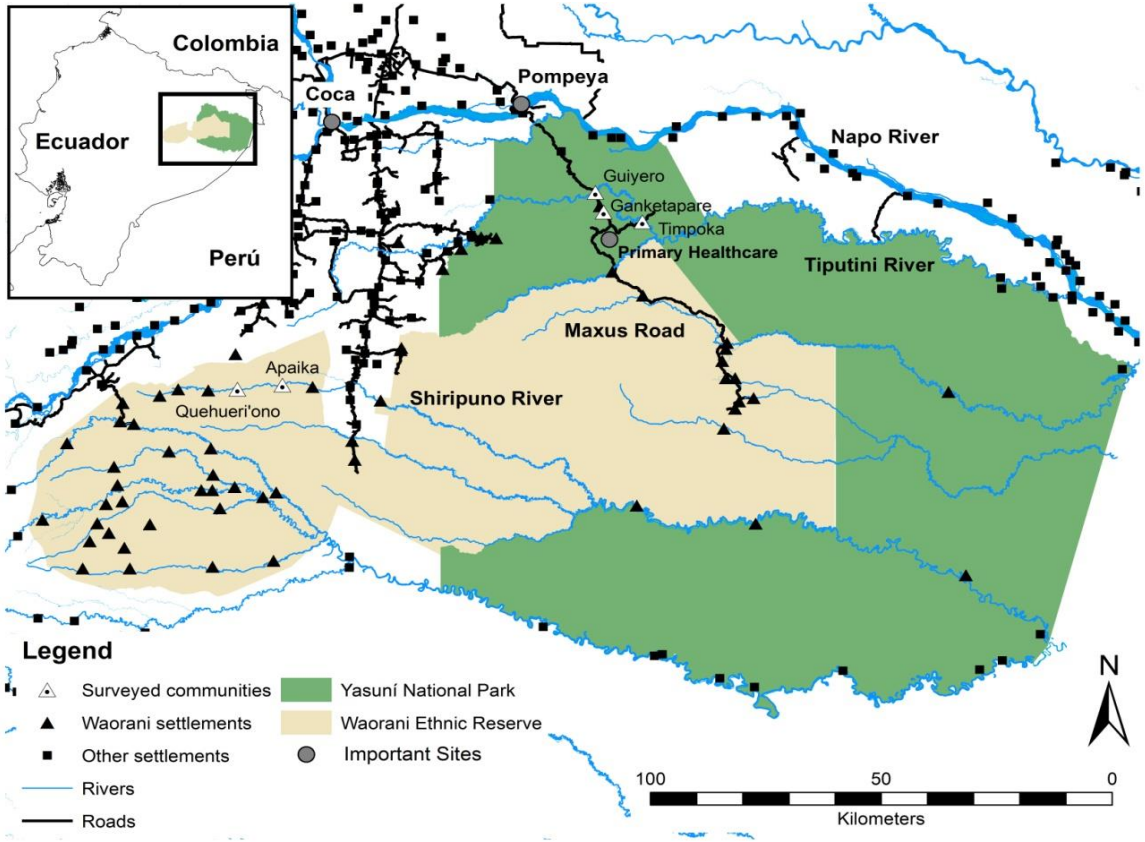
Introducción/Motivación

- Interés académico en conocimiento sobre plantas etnobotánicas medicinales esta aumentando
  - PERO: El conocimiento sobre estas plantas en sociedades indígenas está disminuyendo (Hamilton, 2004).
- Numerosos estudios que recogen conocimiento etnobotanico Waorani
  - PERO: Poca énfasis en como este conocimiento es afectado por cambios socio culturales en la sociedad Waorani.

Los Waorani

- Sociedad indígena de cazadores y horticultores
- Ca. 3800 individuos en 47 comunidades
- Este de Ecuador (provincias de Napo, Orellana y Pastaza)
- Biosfera Yasuní =Waorani Ethnic Reserve + Parque Nacional Yasuní
- Contacto pacífico 1956 por misioneros
- Exploración petrolífera
- Proceso de modernización

  - Impacto en su conocimiento tradicional etnobotanico?
  - Diferente impacto en comunidades con diferentes características socio-culturales?



Map by Santiago Espinosa

Metodología

Settings/Localización

- 3 comunidades integradas
- 2 comunidades aisladas.

Table 1. Community characteristics

				Access			Distances		
Community	households	households participated	n	river	aviation	street	travel time to health center	travel time to school	travel time to closest market
Guiyero	12	10	18	yes	no	yes	< 0,5h by bus	0h	<1h by bus
Ganketapare	2	2	6	no	no	yes	< 0,5h by bus	< 0,25h by bus	1h by bus
Timpoka	7	6	17	yes	no	yes	< 0,5h by bus	0,5h by bus	1,5h by bus
Quehueiri-Uno	12	10	16	yes	yes	no	6h by motorboat + 2h by bus	0h	6h by motorboat
Apaika	1	1	2	yes	no	no	4h by motorboat + 2h by bus	2h by boat	4h by motorboat

Metodología

Data colection/Datos/Recogida de datos

- 14 plantas (10 medicinales + 4 culturales)

  →Planta cultural: Planta con uso cultural que no sea medicinal

Table 2. Selected plants with respective uses and preparations

Species	Family	Growth form	Part used	wild/cultivated plant	Use	Preparation
Astrocaryum chambira	Arecaceae	Tree	young leaves	wild	Produce thread	Cut young leaves, separate outer part of young leaves, wash, cook, dry and roll them to a thread
Cecropia ficifolia	Cecropiaceae	Tree	bark, leaf, bud	wild	Shampoo	Smash bark,leaf or bud
Clibadium surinamense	Asteraceae	Bush	leaves	cultivated	Fishing	In a hole previously made in the ground, leaves are smashed and used as poison for fishing
Curare tecunarum	Menispermaceae	Vine	bark	wild	Hunting	Put scrached bark into funnel made of leaves.Add water and filter. Boil to obtain thick liquid
Abuta grandifolia	Menispermaceae	Bush	stem,root	wild	Stomach ache,diarrhea,stomach parasites	Scrached bark or root boiled in water. Drink the liquid
Croton lechleri	Euphorbiaceae	Tree	sap	wild	Epidermic infections	Apply the sap of the tree directly on the skin
Eucharis grandiflora	Amaryllidaceae	Herbaceous plant	bulb	wild	Abcess	Apply the smashed bulb directly on the abscess
Euterpe precatoria	Arecaceae	Tree	roots	wild	Influenza	The young red roots are boiled in water. Drink the liquid
Fittonia albivenis	Acanthaceae	Herbaceous plant	fruits	wild	Pimples	Apply smashed fruits directly on the skin
Iryanthera paraensis	Myristicaceae	Tree	sap	wild	Fungus	Apply sap directly on the affected parts
Musa x paradisiaca	Musaceae	Herbaceous tree	sap	cultivated	Diarrhea	Drink sap of the trunk
Neea sp.	Nyctaginaceae	Tree	fruits	wild	Prevent cavaties	Chew fruits
Theobroma subinicarum	Sterculiaceae	Tree	bark	wild	Fever	Cook macerated bark in water. Drink the liquid
Uncaria guianensis	Rubiaceae	Vine	bark	wild	Influenza and cough	Cook macerated bark in water. Drink the liquid

Metodología

Data colection/Datos/Recogida de datos

- n=59 (29 mujeres, 30 hombres)
- 18 personas (31%) en comunidades aisladas
- 41 personas (69%) comunidades integradas
- Entrevista semiestructurada
  - Preguntas socioeconómicas
  - Reconocimiento de plantas

Metodología

Análisis de datos

- Conocimiento etnobotanico individual
  - 1 punto para saber uso
  - 1 punto para saber preparación

  →No fue considerado el nombre de la planta: puede variar según comunidad, familia y según estado de crecimiento.
- Variables socio-económicas:
  - menos que 3 meses en escuela, ciudad, empresa se consideraba =0
  - menos que 30 min internet/semana=0
- Programa estadístico R:
  - Welch two sample t-tests
  - Regresión linear

Resultados y Discusión

Table 3. Frequencies of correct answers about use and preparation

Variable	Minimum	Maximum	Absolute frequency	Relative frequency
Total of communities				
General ethnobotanical knowledge	0	1652	831	0,50
Cultural ethnobotanical knowledge	0	472	371	0,79
Medicinal ethnobotanical knowledge	0	1180	460	0,39
More isolated communities				
General ethnobotanical knowledge	0	504	308	0,61
Cultural ethnobotanical knowledge	0	144	128	0,89
Medicinal ethnobotanical knowledge	0	360	180	0,50
More marked-integrated communities				
General ethnobotanical knowledge	0	1148	523	0,46
Cultural ethnobotanical knowledge	0	328	243	0,74
Medicinal ethnobotanical knowledge	0	820	280	0,34
Interviewees with both Waorani parents				
General ethnobotanical knowledge	0	1316	661	0,50
Cultural ethnobotanical knowledge	0	376	289	0,77
Medicinal ethnobotanical knowledge	0	940	372	0,40
Interviewees with one parent Waorani				
General ethnobotanical knowledge	0	336	170	0,51
Cultural ethnobotanical knowledge	0	96	82	0,85
Medicinal ethnobotanical knowledge	0	140	88	0,63

Resultados y Discusión

- Genero y conocimiento

  →No hay correlación significante ($p>0.05$)

- Padres interculturales

  →No hay correlación significante ($p>0.05$)

- Edad y conocimiento

  →Correlación positiva significante ($R^2=0.33$, $p<0.001$)

Resultados y Discusión

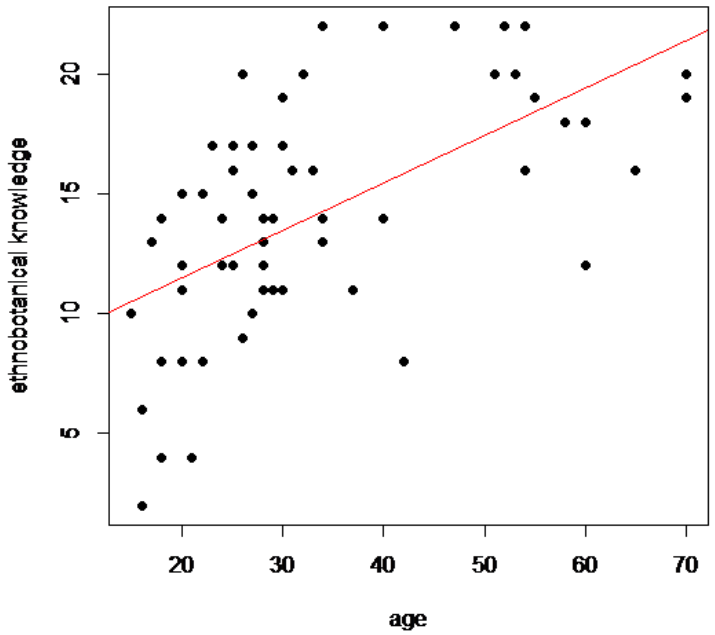


Figure 2. Relation ethnobotanical knowledge and age.

Resultados y Discusión

- Genero y conocimiento

  →No hay Correlación significante ($p>0.05$)

- Padres interculturales

  →No hay Correlación significativa ($p>0.05$)

- Edad y conocimiento

  →Correlación positiva significante ($R^2=0.33$, $p<0.001$)

- Conocimiento y escolarización

  →Correlación negativa entre años en sistemas educativos y conocimiento ($R^2=0.07$, $p<0.05$)

Resultados y Discusión

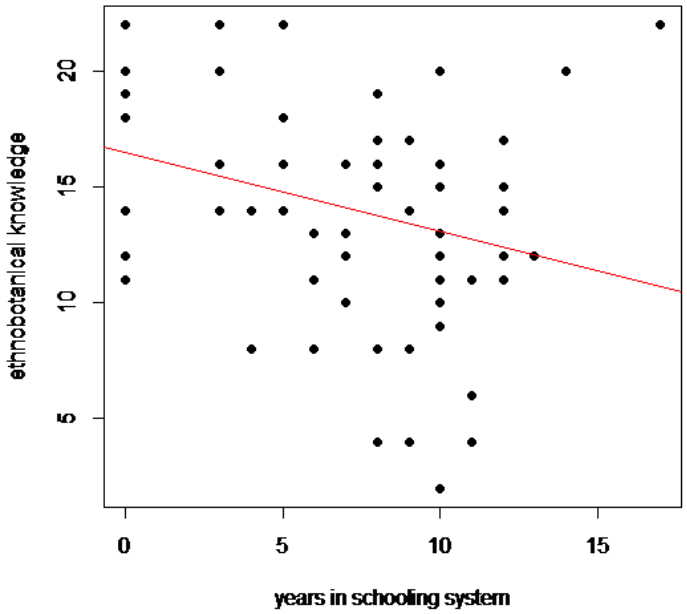


Figure 3. Relation between ethnobotanical knowledge and years in schooling system

Resultados y Discusión

- Genero y conocimiento

  →No hay Correlación significante ($p>0.05$)
- Padres interculturales

  →No hay Correlación significativa ($p>0.05$)
- Edad y conocimiento

  →Correlación positiva significante ($R^2=0.33$, $p<0.001$)
- Conocimiento y escolarización

  →Correlación negativa entre años en sistemas educativos y conocimiento ($R^2=0.07$, $p<0.05$)
- Conocimiento en diferentes comunidades

  → Mayor conocimiento en comunidades mas aisladas ($p<0.001$).

Resultados y Discusión

- Globalización y Aculturación
- Cambios socio-economicos y culturales anteriores y actuales
  - Misioneros
  - Exploración petrolifera

    → Introducción de valores modenos

    → Supresión de valores tradicionales

    →Final del aislamiento fisico por construcción de carreteras

    →Asimilación y captacion por el mundo globalizado (materialismo, ideologias)

→Adaptacion causó cambios socio-economicos y culturales profundos

  - ej. conocimiento etnobotanico:
    - Abandonado ya que no parece mas ser adequado en las nuevas realidades (Problemas de salud pueden ser reueltos con medicina moderna)
    - Educación formal no enfatiza conocimiento etnobotanico como parte del tipo de enseñanza que prepara el alumno para el mundo globalizado

Conclusiones

- Concimiento etnobotanico infuido por factores demograficos y socio-economicos
  - Mayor conocimiento en personas mayors (Cambio cultural afecta diferente)
  - Educación formal
  - Localización de comunidad
  - Infraestructura
  - Ecoturismo?
  - Conocimiento medicinal mas vulnerable y en peligro de mas erosion en el futuro
- Diferencias en conocimiento etnobotanico entre comunidades debido diferentes circunstancias fisicas y socioeconomicas
  - Mas conocimiento en comunidadeas mas aisladas fisicamente , sin carretera, dificil acceso a centro de salud
- Erosión de conocimiento tradicional etnobotanico
  - Bien cultural en peligroHence, elders have a greater ethnobotanical knowledge than the younger generations. This shows an erosion of traditional knowledge and reveals the vulnerability of this exceptional cultural good. On the other hand, it indicates that this knowledge is still part of the Waorani society, which means it has the potential to be conserved. With prompt and appropriate policies, the loss of this valuable knowledge might be minimized or even recovered. Policymakers are advised to take action quickly before this uniqueset of knowledge fades away.

sustainability

MDPI

Article

Factors Affecting Traditional Medicinal Plant Knowledge of the Waorani, Ecuador

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Abstract: This paper explores how medicinal plant knowledge of the Waorani (Ecuador) varies with socio-economic and demographic factors. Medicinal plant knowledge was compared at individual and community levels. Semi-structured interviews were performed with 56 informants (men N = 29, women N = 27) between 15 and 70 years old in five Waorani communities located within the Yasuní National Park and Waorani Ethnic Reserve. We found a positive correlation between an informant's medicinal plant knowledge and age, and a negative correlation between informant's medicinal plant knowledge and the years of schooling. Reasons behind these findings are thought to be in the rapid socio-cultural changes of the Waorani due to globalization processes. Increased accessibility to health centers and improved transportation infrastructure result in a loss of ethnobotanical knowledge.

Keywords: ethnobotany; traditional ecological knowledge; indigenous communities; Ecuadorian amazon; loss of knowledge; globalization; global change; acculturation; socio-cultural changes

1. Introduction

Paradoxically, academic interest on ethnobotany, and specifically medicinal plants, is increasing while rural and indigenous people's knowledge about the use of plants for medicinal purposes is declining [1]. Studies around the world have shown that elders, in general, tend to know more about medicinal plants than younger generations [2–11]. Voeks and Leony [9] explain the phenomena of finding a greater knowledge within older generations in that people acquire more knowledge with age. Nevertheless, other authors claim that the majority of acquisition of traditional skills, including knowledge on plants, happens before the age of 15 [11–14]. However, the differences in knowledge might not be explained by the greater life experience of the elders, but by other socio-economic factors.