

Supplementary Information

Human-Environment System Knowledge: A Correlate of Pro-Environmental Behavior. *Sustainability* 2015, 7, 15510-15526

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Note:

The items listed below were used in the following study:

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The original Spanish items were translated by a professional translator. Item content should be verified before being used in cultural or geographical contexts other than Chile.

Correct answers are indicated by a black circle.

Please check with authors for a new version of the scale.

Human-Environment System Knowledge (18 items)

1. What is the greenhouse effect?

- a) The effect of a greenhouse on plants.
- b) The effect of a greenhouse on the people working in it.
- c) The effect of some gases to cool the atmosphere.
- d) The effect of some gases that damage the ozone layer in the Earth's atmosphere.
- The effect of some gases that trap heat in the Earth's atmosphere.

2. Which of these gases does not belong to the greenhouse gases?

- a) Water vapor (H₂O).
- b) Carbon dioxide (CO₂).
- c) Methane (CH₄).
- d) Sulphur dioxide (SO₂).
- e) Nitrous oxides (NO_x).

3. What is the carbon footprint of a product?

- a) The total amount of carbon emitted directly or indirectly in the production of the product.
- b) The amount of CO₂ emitted in transporting the product.
- c) The carbon cycle on Earth.
- d) The total amount of all greenhouse gases emitted directly or indirectly in the production and transporting of the product.
- e) The amount of CO₂ released when a product decays or rots.

4. What are the effects of global warming?

- a) Thaw.
- b) Sea level rise.
- c) Drought.
- d) Species extinction.
- e) All the answers.

5. Which of these substances is the most harmful to humans?

- a) Particulate matter of 2.5 microns.
- b) Sulphur dioxide (SO₂).
- c) Carbon dioxide (CO₂).
- d) Nitrous oxides (NO_x).
- e) Particulate matter of 10 microns.

6. Which of these forms of energy is conventional?

- a) Wind.
- b) Solar.
- c) Hydraulic.
- d) Geothermal.
- e) Maritime.

7. What is the sector that uses the most water in Chile?

- a) Agriculture.
- b) Mining.
- c) Domestic.
- d) Industry.
- e) Forestry.

8. What is drought?

- Availability of water lower than that normally found in a given area.
- b) Areas without water.
- c) Zones where precipitations do not exist.
- d) Water cuts.
- e) Lack of surface water.

9. Which of the following phenomena is the main cause of the increase in global temperature over the last 20 years?

- a) The distance that varies between the sun and Earth.
- b) Reduction of the ozone layer, called the “ozone hole”.
- The increase in the emission of “greenhouse gases”.
- d) The change in ocean currents, such as “El Niño”.
- e) The change in the tilt of Earth’s axis.

10. Which of these forms of energy is not renewable?

- a) Solar.
- b) Wind.
- c) Geothermal.
- d) Hydraulic.
- Nuclear.

11. What is wrong with carbon dioxide (CO₂)?

- a) It damages many plant species.
- Contributes to the greenhouse effect.
- c) It is poisonous to some small species.
- d) There are fewer in the atmosphere.
- e) Damages the airways of the human being.

12. Which of the following practices is accepted in organic farming?

- a) Synthetic fertilizers.
- Irrigation technology.
- c) Regulators of plant growth.
- d) Pesticides /herbicides.
- e) Genetically modified seeds

13. Which of the following diseases would not be caused by heavy metals (such as mercury, lead and arsenic) in drinking water?

- a) Hypertension.
- b) Cancer.
- Pneumonia.
- d) Chronic headache.
- e) Abortions.

14. Which is the major cause of pollution of groundwater with nitrates?

- a) Agriculture.
- b) Vehicular traffic.
- c) Household garbage.
- d) Mining.
- e) Elimination of wastewater into rivers.

15. Which of the following gases has greater contribution to the greenhouse effect?

- a) Methane (CH₄).
- b) Nitrous oxides (NO_x).
- c) Ozone (O₃).
- d) Water vapor (H₂O).
- e) Carbon dioxide (CO₂).

16. What is the impact that detergents have on the environment?

- a) A positive impact because they release nutrients to plants.
- b) A positive effect because they release gases that decrease the negative impact on the ozone layer.
- c) A negative impact since upon degradation release toxic gases.
- d) A negative impact because they pollute waters with phosphorus damaging flora and fauna of the aquatic system.
- e) Have no impact.

17. Which is batteries impact on the environment?

- a) A positive impact, because when they degrade they release iron it does well for plants.
- b) A positive effect, because when they degrade they release gases that reduce the negative impact on the ozone layer.
- c) A negative impact, because when they degrade they release toxic gases.
- d) Don't impact on the environment.
- e) A negative impact because they release toxic metals into the environment.

18. What is the effect of the use of fossil fuels on the environment?

- a) The gases released by combustion stop the sun's radiation from leaving the atmosphere, causing the greenhouse effect.
- b) The gases released by combustion decrease the destruction of the ozone layer.
- c) The gases released by combustion stop the sun's radiation reaching the earth, causing the greenhouse effect.
- d) Fuels decrease the greenhouse effect because the gases released by combustion react with CO₂ molecules.
- e) The gases released by combustion destroy the ozone layer

Environmental Action Knowledge (17 items)**19. Which action does not help to reduce garbage?**

- a) Read news online instead of buying newspapers.
- b) Buy large containers instead of small.
- c) Use cloth bags for shopping.
- d) Buy clothes and used products.
- Switching to vegetarian food.

20. Which action does not reduce greenhouse gases?

- a) Prefer public transport to a private one.
- b) Plant trees.
- c) Save energy.
- d) Heat the house with solar energy.
- Driving catalytic cars.

21. Which of these products should not be thrown away for being highly polluting?

- Batteries.
- b) Cans.
- c) Plastics.
- d) Tetra Pak.
- e) Expired food.

22. Which of these options indicates the amount of water used in the production of a product?

- a) ISO 9000
- b) Good Agricultural Practices (GAP).
- Water footprint.
- d) Irrigation program.
- e) Water meter.

23. Which action does not help to save energy costs in everyday life?

- a) Unplug all electrical appliances.
- Turn off electronic devices without unplugging.
- c) Close the doors and windows when the heating works.
- d) Install solar panels.
- e) Use the lowest amount of light possible.

24. How one can get companies to reduce their emissions of greenhouse gases?

- By buying products from companies having known carbon footprint.
- b) By buying fair-trade products.
- c) By preferring local stores.
- d) By buying cheaper products.
- e) By preferring products from smaller companies.

25. Why one should use the least amount of detergent possible?

- a) Detergents contain many chlorinated hydrocarbons.
- b) Detergents contain high amounts of heavy metals.
- It is difficult to separate them from the water in a treatment plant.
- d) Detergents are harmful to sewage pipes.
- e) When used in excess, foam is formed causing lower efficacy.

26. Why is it important to recycle aluminum rather than throw it away?

- a) Aluminum damages garbage incinerators.
- b) Aluminum emits toxic substances in waste incineration.
- c) The production of new aluminum produces toxic substances.
- The new aluminum production requires very high amounts of energy.
- e) Aluminum is scarce in nature.

27. Which form of consumption it is not considered ecological *per se*?

- a) Buying seasonable fruits and vegetables.
- b) Buying local products.
- Buying the cheapest food possible.
- d) Buying food from small vendors or markets, rather than the big supermarkets.
- e) Buying unprocessed foods instead of processed products and/or frozen.

28. Which of the following actions does not save water?

- a) Take a shower instead of taking a bath.
- Wash the dishes by hand instead of using a dishwasher.
- c) Wash the car with a pail instead of using a hose.
- d) Reduce the volume of water tank in WC.
- e) Water the garden in the afternoon or evening.

29. Which of the following waste is not biodegradable?

- a) Egg shells.
- b) Waste fruit.
- c) Waste of coffee.
- Waste from electronic equipment.
- e) Newsprint.

30. How much water is used in a shower about 5 min?

- 80–120 liters.
- b) 700–800 liters.
- c) 15 to 15 liters.
- d) 300–500 liters.
- e) 1000–5000 liters.

31. How the use of detergents can be reduced?

- a) Washing sweatshirt and trousers after being used for a day.
- b) Sorting sweatshirt and trousers after being used for a day.
- c) After using for a day, wash trousers and sort sweatshirt to use them once more.
- d) After using for a day, wash sweatshirt and sort trousers to use them once more.
- e) Buying the cheapest detergent.

32. How can one more efficiently use paper?

- a) Bury it in the ground.
- b) Collect used paper and deposit it in the landfill.
- c) Collect used paper and then burn it in a bonfire lit especially to get rid of it.
- d) Collect used paper and then use it for roasts or to light the wood stove or wrappings.
- e) Buying the cheapest paper.

33. Are there advantages in buying locally made products over imports?

- a) There are no advantages if they are of equal quality.
- b) There are advantages, because this will generate lower emissions of greenhouse gases.
- c) There are advantages because these products cause less damage to the ozone layer.
- d) There are advantages because the products that come from far away arrive at their destinations with reduced quality.
- e) There are no advantages because the production process is the same.

34. What action does not help the sustainable development?

- a) Take shorter showers.
- b) Buy latest technology's products.
- c) Avoid plastic bottles.
- d) Separate waste for easy recycling.
- e) Use public transport.

35. What action does not help to reduce gas consumption?

- a) When cooking or heating water to cover the container.
- b) Use electric heating.
- c) Take shorter showers.
- d) On hot days take showers with cold water.
- e) Leave the water heater in on position in order to save time.

Environmental Efficiency Knowledge (20 items, used only in the pilot questionnaire)

39. What is the appliance that consumes more energy?

- TV.
- b) Washing Machine.
- c) Dishwasher.
- d) Fan.
- e) Stereo.

40. Which food causes more CO₂ emissions per kilogram produced?

- Beef.
- b) Fish.
- c) Fruits.
- d) Dairy.
- e) Vegetables.

41. How much less do LED bulbs spend compared to conventional bulbs?

- a) 30%
- b) 45%
- c) 70%
- 80%
- e) 100%

42. Which of these wastes has high degradation time?

- a) Tetra Pak.
- b) Cigarette butts.
- c) Drink cans.
- d) Corks.
- Glass bottles.

43. Which of the following packs emit less CO₂ in their life cycle?

- a) Tetra Pak.
- Returnable bottle glass.
- c) Bottle glass disposable.
- d) Plastic bottle.
- e) Can of metal.

44. Which of these products has a higher water footprint?

- Eggs.
- b) Snuff.
- c) Milk.
- d) Wine.
- e) Beer.

45. On average, more energy is spent at home to...:

- a) Temperature condition of rooms (heating in winter and air conditioned in summer).
- b) Lighting.
- c) In the kitchen (fire and oven).
- d) Operation of appliances (refrigerator, blender).
- e) Operation of electronic equipment (TV, computer).

46. Which of these appliances use more energy put into the “stand by” mode?

- a) Modem
- b) Computer
- c) Stereo
- d) Cell Charger
- e) Television

47. Which means of transport spends less energy (per person per kilometer)?

- a) Car.
- b) Buses
- c) Urban Collective.
- d) Train.
- e) Aircraft.

48. How many times more water is needed to produce one kilogram of beef, compared to a kilogram of staple foods such as potatoes, corn or wheat?

- a) 2 times.
- b) 3 times.
- c) 500 times.
- d) 15 times.
- e) 300 times.

49. The production and transport of batteries need...

- a) 5 times
- b) 1000 times
- c) 2000 times
- d) 50 times
- e) ... 10,000 times more energy than containing.

50. After how many years is a plastic bag completely degraded in a landfill?

- a) 1 year.
- b) 10 years.
- c) 50–100 years.
- d) 400–500 years.
- e) Never.

51. Which recycled material saves more energy in comparison to producing it?

- a) Aluminum.
- b) Glass.
- c) Can.
- d) Paper.
- e) Plastic.

52. How many times can returnable beer containers be reused on average?

- a) 5 times.
- b) 1000 times.
- c) 200 times.
- d) 40 times.
- e) 800 times.

53. How much water is needed for a bath in the tub?

- a) 20 liters.
- b) 50 liters.
- c) 1000 liters.
- d) 200 liters.
- e) 4000 liters.

54. What is the average water daily consumption per person in Chile?

- a) 10 liters.
- b) 170 liters.
- c) 500 liters.
- d) 1000 liters.
- e) 1500 liters.

55. What is the average electricity monthly consumption in a Chilean family home (4 people)?

- a) 2000 kWh.
- b) 15,000 kWh.
- c) 10 kWh.
- d) 220 kWh.
- e) 20 kWh.

56. How long does it take to recover the cost of an efficient light bulb?

- a) 2 years.
- b) 2 days.
- c) 4 months.
- d) 5 years.
- e) 1 week.

57. When driving a car, which of these activities causes more fuel to be spent than necessary?

- a) Accelerate slowly and not to the end.
- b) Driving speed between 60–80 km/h.
- c) Do not use the air conditioning in the car.
- d) Do not accelerate the car after stopping.
- Driving with open windows.

Pro-Environmental Behavior (35 items)

Likert	Never	Seldom	Occasionally	Usually	Always	N/A
I ride a bicycle or take public transportation to work or school.						
* I buy organic food.						
<i>I take tub baths.</i>						
<i>I buy beverages in cans.</i>						
I wait until I have a full load before doing my laundry						
<i>I drive my car in or into the city.</i>						
<i>I wash dirty clothes without prewashing.</i>						
<i>For longer trips (more than 500 km), I take an airplane.</i>						
<i>If I am offered a plastic bag in a store, I take it.</i>						
In nearby areas (around 30 km), I use public transportation or ride a bike.						
I collect and recycle used paper.						
I bring empty bottles to a recycling bin.						
I have pointed out unecological behavior to someone.						
I contribute financially to environmental organizations.						
I buy drinks or beer in returnable bottles						
* <i>I buy frozen or prepared foods ready to heat.</i>						
I buy products in refillable container.						
I boycott companies with an unecological background.						
I buy seasonal produce.						
<i>I use a clothes dryer.</i>						
I talk with friends about problems related to the environment.						
<i>I keep the engine running while waiting for a train crossing</i>						
<i>I kill insects with a chemical insecticide.</i>						

Yes/No	Yes	No	N/A
* I produce my own organic food (fruits, vegetables or honey, <i>etc.</i>).			
I reuse my shopping bags.			
<i>In the winter, I keep the heat on so that I do not have to wear a sweater.</i>			
<i>I put dead batteries in the garbage.</i>			
* I make compost with my organic waste (food scraps, fruit and vegetable waste).			
I am a member of an environmental organization.			
I own energy efficient household devices.			
I have already looked into the pros and cons of having a private source of solar power.			
I use renewable energy sources.			
I refrain from owning a car.			
I share the car with one or more people.			
* When I take a shower, I close the water, then I use the soap, then I open it again to rinse myself, avoiding to leave the water running all the time.			

Items in italics indicate negatively formulated behaviors; they are recoded and should be read as “I refrain from...”; * New items developed by a group of environmental scientists. All the other items are from the scale of Kaiser and Wilson [1].

References

1. Kaiser, F.G.; Wilson, M.R. Goal-directed conservation behavior: The specific composition of a general performance. *Personal. Individ. Differ.* **2004**, *36*, 1531–1544.

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