Valuation of Water Resources in Guatemala.

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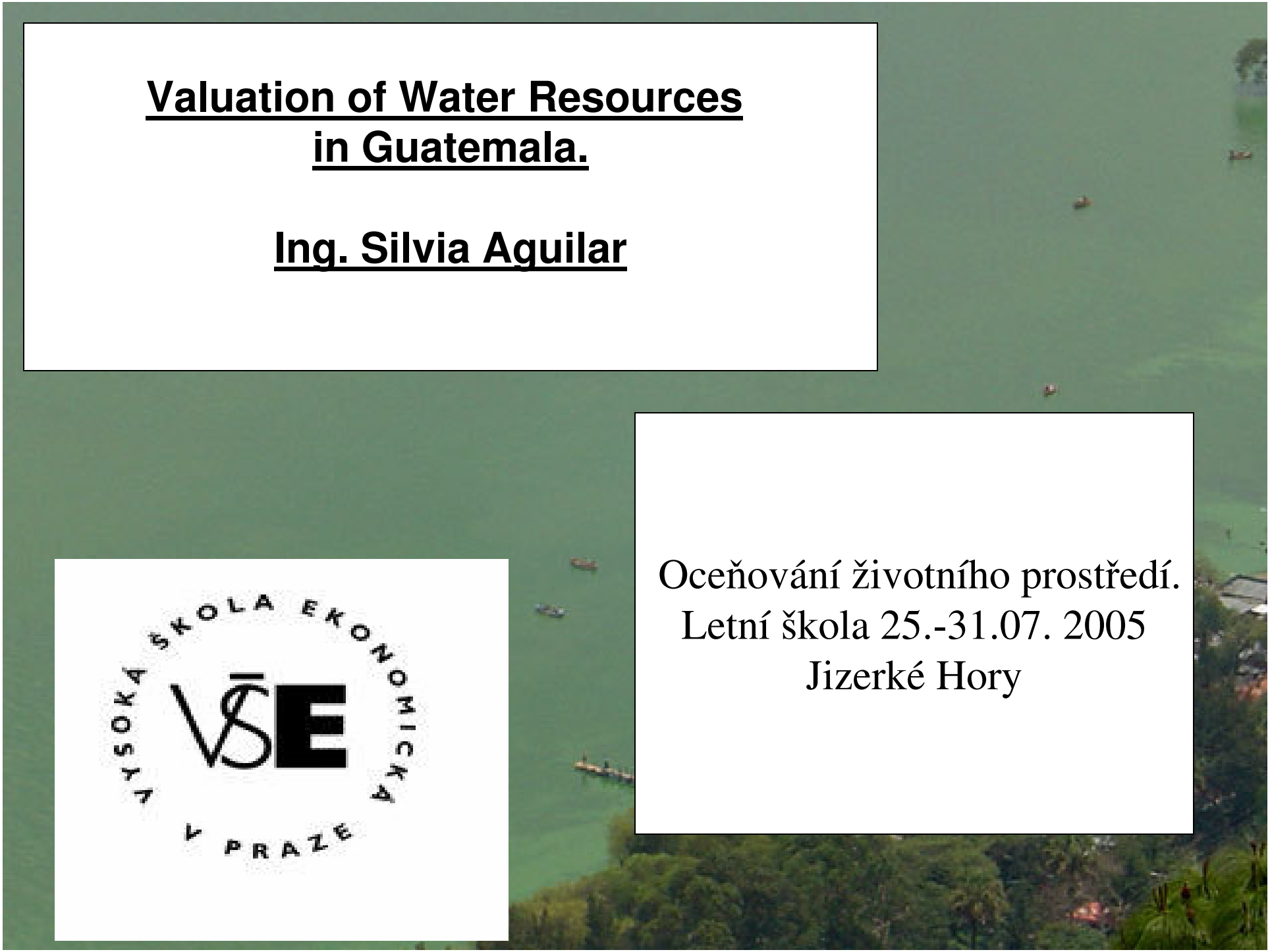


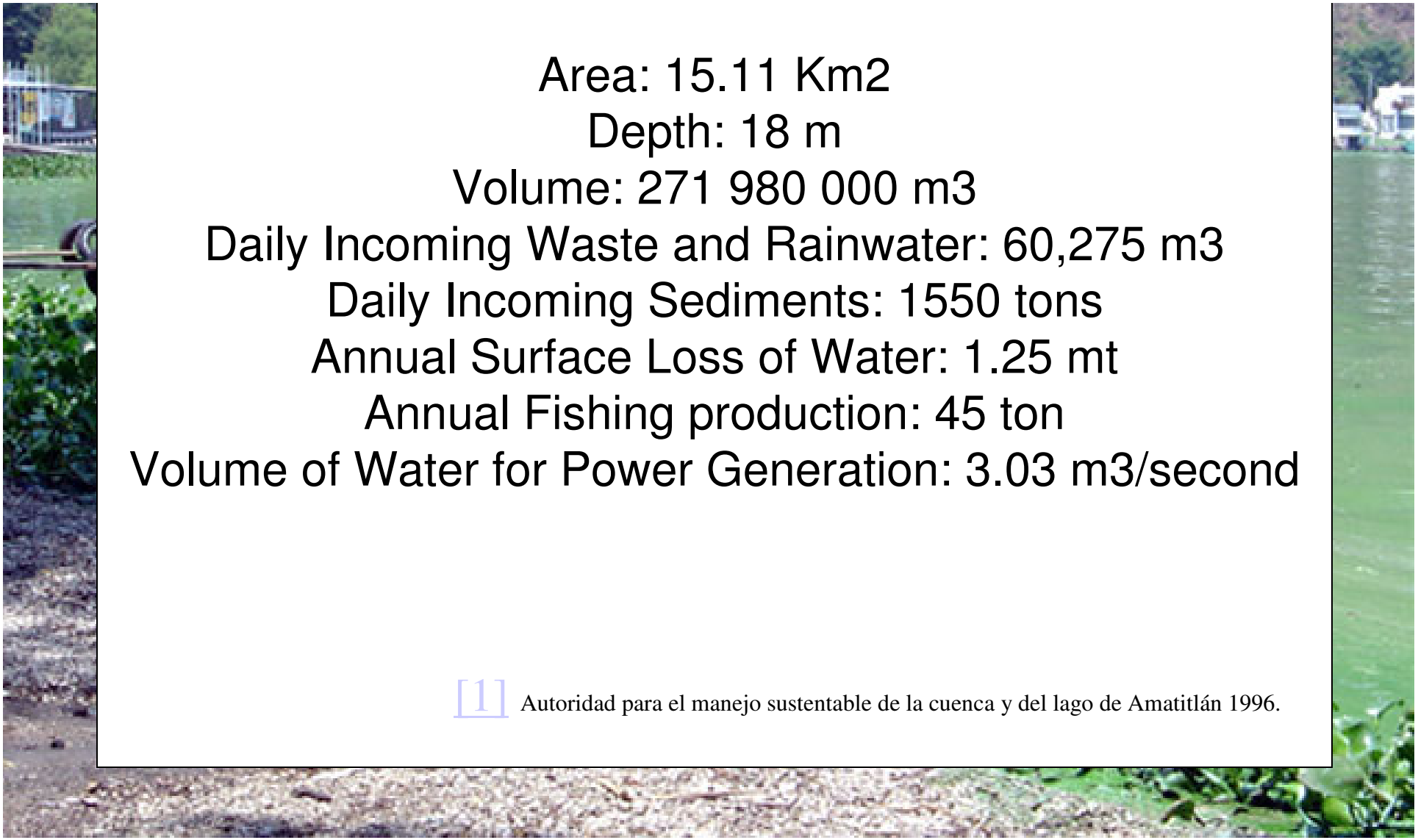
Oceňování životního prostředí.
Letní škola 25.-31.07. 2005
Jizerké Hory


Petén Itzá
Mexico
Belize
Caribbean Sea
Honduras
Amatitlán
El Salvador
Pacific Ocean

Amatitlán Lake

-The fourth largest lake in Guatemala .
- Located aprox. 25 km south of the capital city.
- Was populated already since 2000 BC.
- The city of Amatitlan was founded in 1536 and grew rapidly.
-At the Colonial time was a “fishing center”.

Amatitlan Lake . 1996[1]



Area: 15.11 Km2
Depth: 18 m
Volume: 271 980 000 m3
Daily Incoming Waste and Rainwater: 60,275 m3
Daily Incoming Sediments: 1550 tons
Annual Surface Loss of Water: 1.25 mt
Annual Fishing production: 45 ton
Volume of Water for Power Generation: 3.03 m3/second

[1] Autoridad para el manejo sustentable de la cuenca y del lago de Amatitlán 1996.

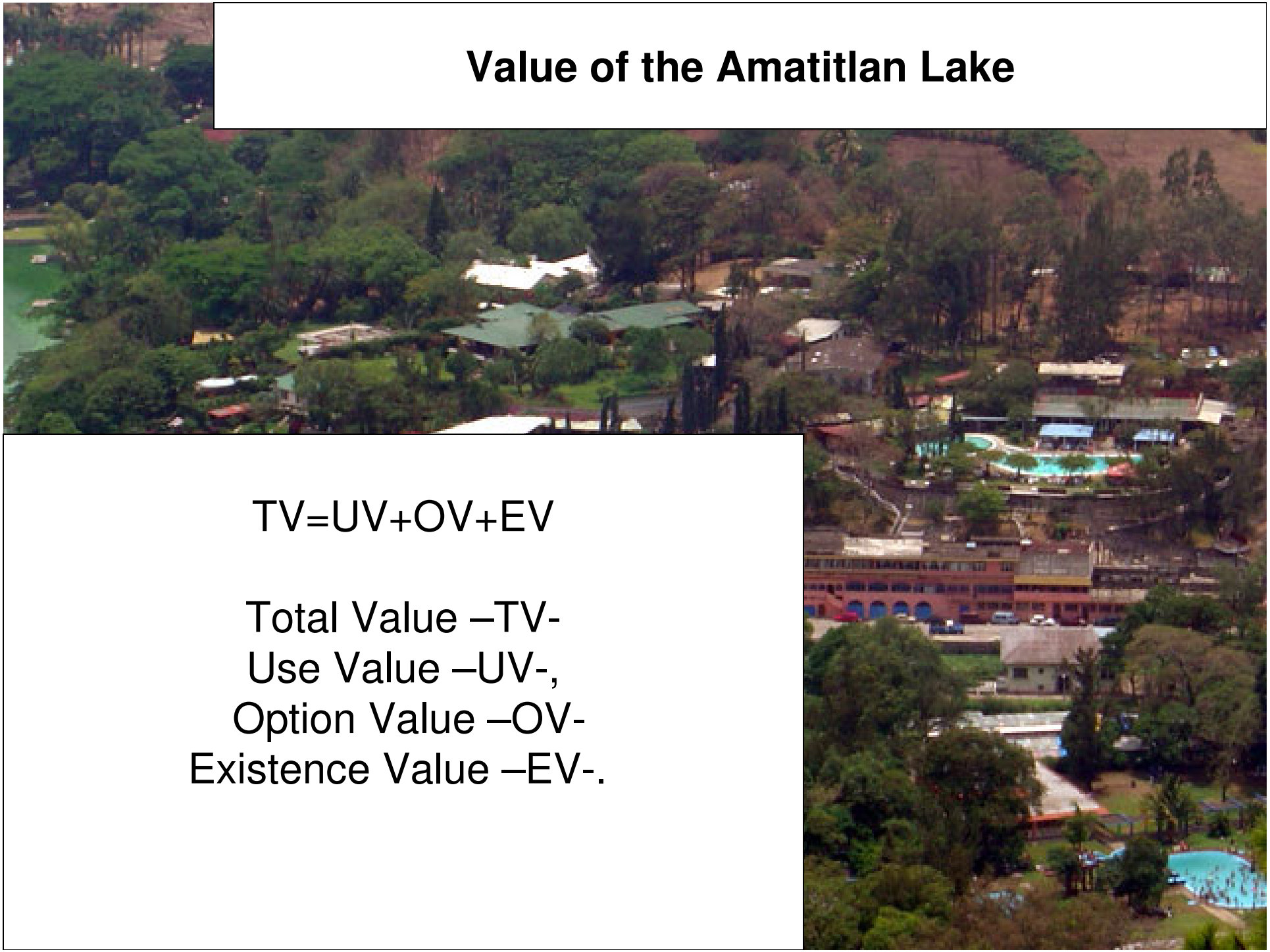
Amatitlan Lake.Ecological Problems.

500.000 tons of sediments per year.
Disturbing change in the aquatic life.
Photosynthesis capacity has been severely reduced.
Each year, 75,000 tons of solid wastes in suspension are carried into the lake,causing eutrophication.

Main Threatens

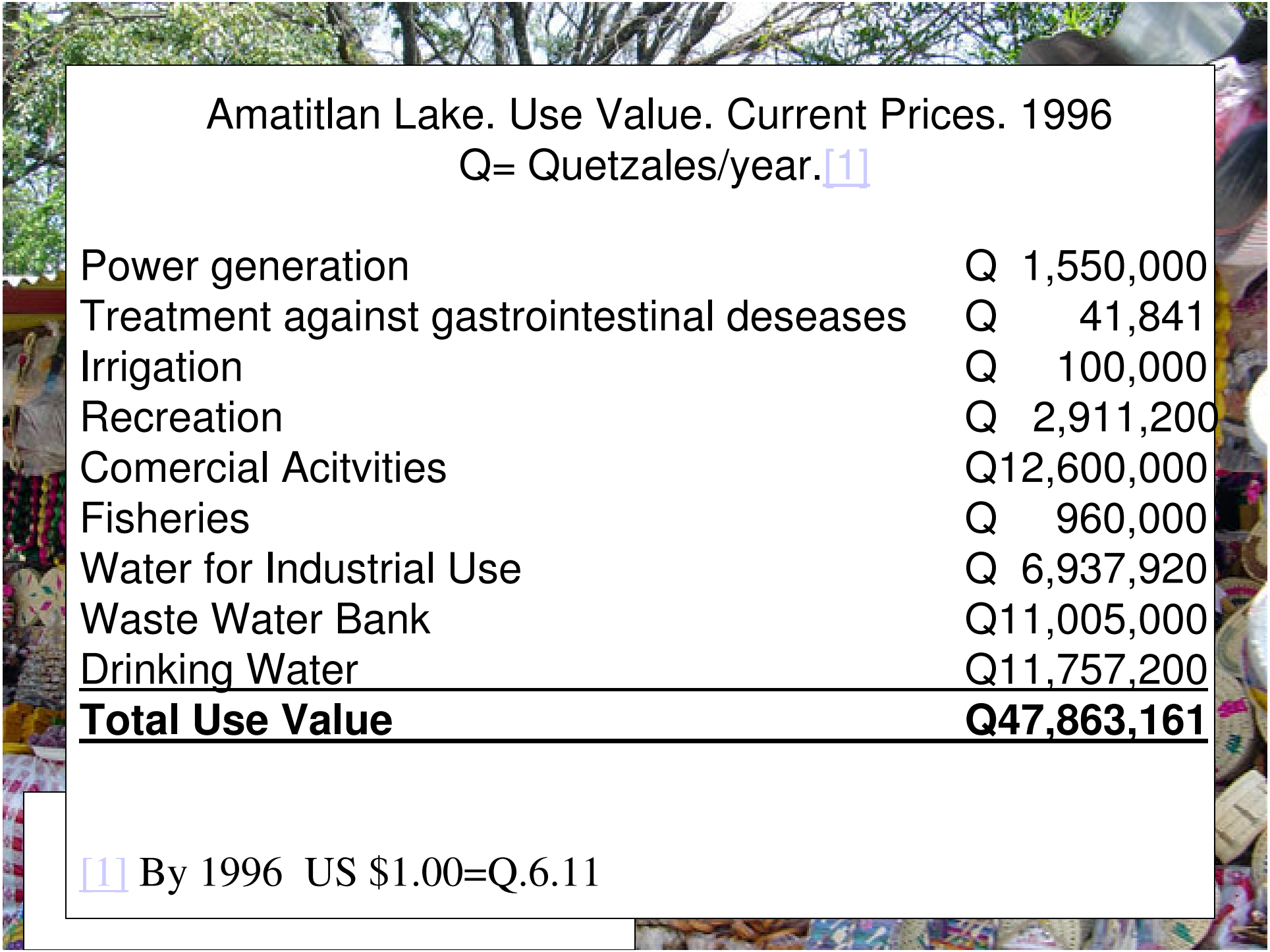
High levels of population growth.
Afforestation.
Intensive agircultural practices nearby the shores.
Industrial waste water.
Overfishing.

Value of the Amatitlan Lake



TV=UV+OV+EV

Total Value –TV-
Use Value –UV-,
Option Value –OV-
Existence Value –EV-.



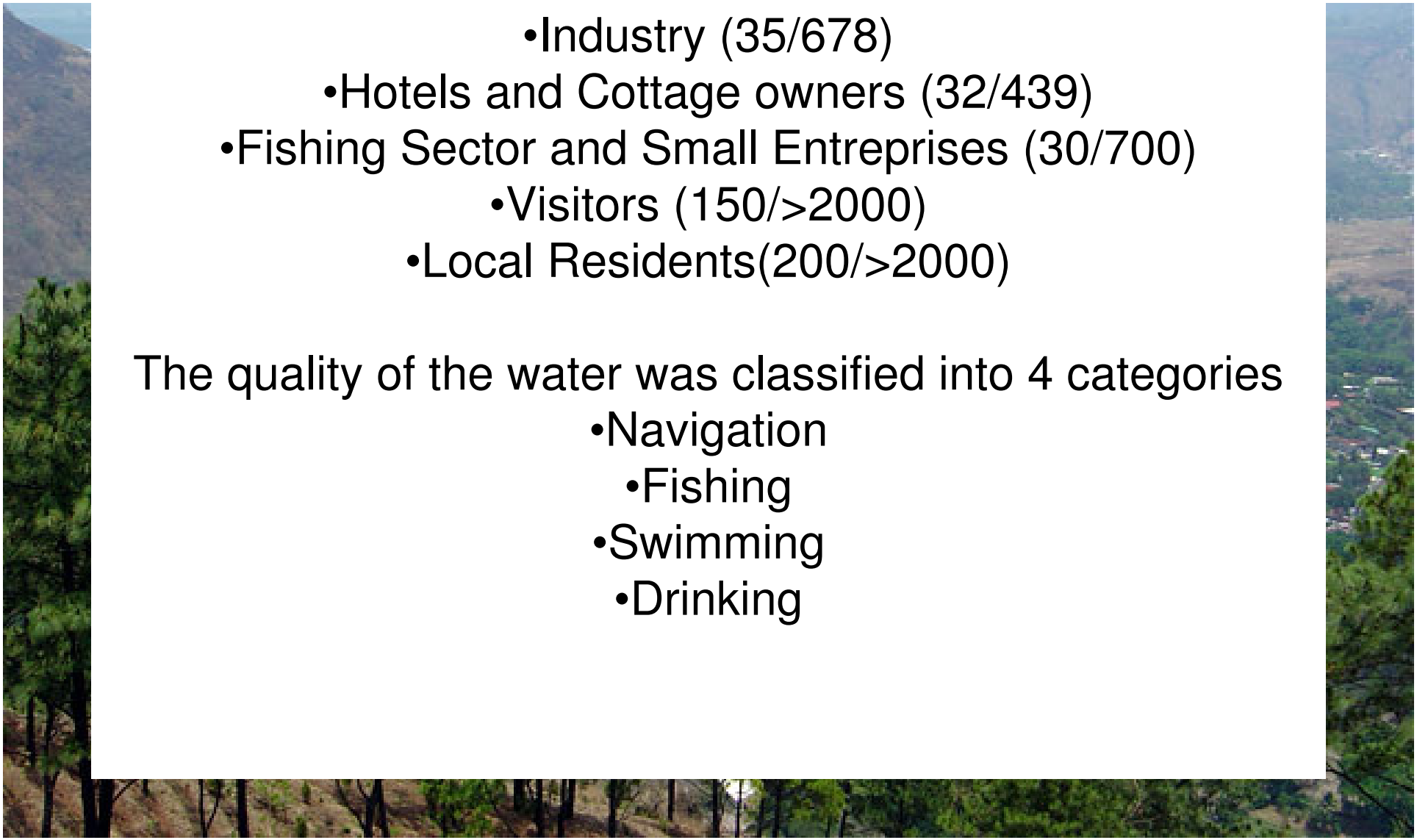
Amatitlan Lake. Use Value. Current Prices. 1996
Q= Quetzales/year.[1]

Power generation	Q 1,550,000
Treatment against gastrointestinal deseases	Q 41,841
Irrigation	Q 100,000
Recreation	Q 2,911,200
Comercial Acitvities	Q12,600,000
Fisheries	Q 960,000
Water for Industrial Use	Q 6,937,920
Waste Water Bank	Q11,005,000
Drinking Water	Q11,757,200
Total Use Value	**Q47,863,161**

[1] By 1996 US $1.00=Q.6.11

Contingent Valuation Method CVM

Stakeholders:



- Industry (35/678)
- Hotels and Cottage owners (32/439)
- Fishing Sector and Small Entreprises (30/700)
- Visitors (150/>2000)
- Local Residents(200/>2000)

The quality of the water was classified into 4 categories

- Navigation
- Fishing
- Swimming
- Drinking

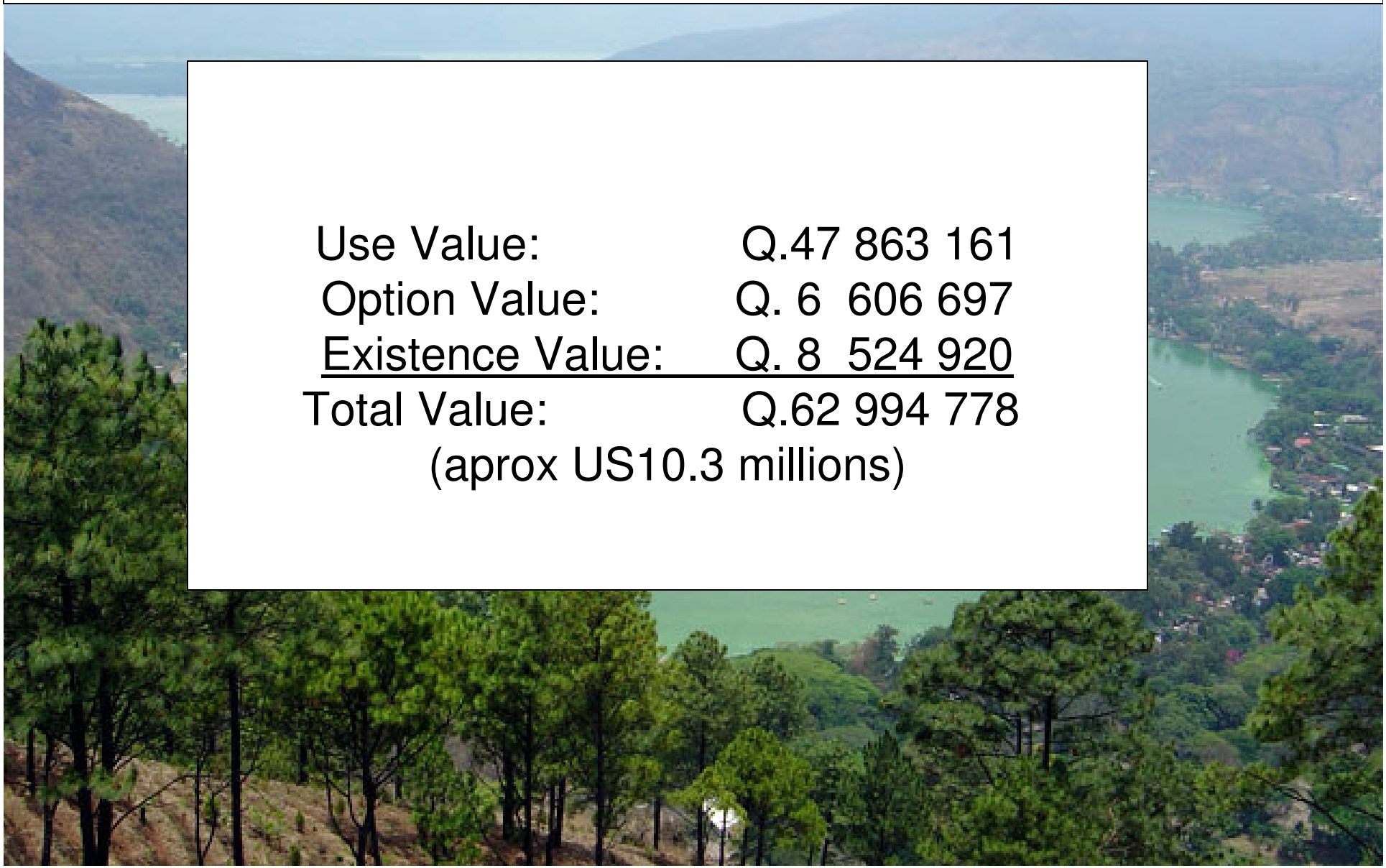
Willingness to pay-Real Demand of the Lake. Relative Numbers

Stakeholders	Yes	No	Do not know
Industry	70%	11%	19%
Hotels	59%	23%	18%
Small entreprises	71%	10%	19%
Visitors	68%	23%	9%
Residents	71%	22%	7%

Marginal Willingness to Pay .Monthly average payment. Quetzales. Current Prices 1996

	Industry	Hotels	Small Entreprises	Visitors	Residents
Navigation	100	107	25	5	5
Fishing	20	50	35	5	5
Swimming	50	100	45	5	5
Drinking	50	100	100	5	10
Total Acumulated	220	357	205	20	25

Amatitlan Lake. Total Value1996. Quetzales. Level:Swimming



Use Value:	Q.47 863 161
Option Value:	Q. 6 606 697
Existence Value:	Q. 8 524 920
Total Value:	Q.62 994 778

(aprox US10.3 millions)

Lake Recovery: Cost Benefit Analysis

Real Contributions. Quality Level:Swimming. Quetzales 1996. Current Prices

Value	Industry	Hotels	Small Entreprises	Visitors	Residents	Total
Option	935.340	798.787	626.220	1.999.200	2.247.150	6.606.697
Existence	652.380	711.180	129.360	3.234.000	3.798.000	8.524.920
Total	1.587.720	1.509.967	755.580	5.233.200	6.045.150	**15.131.617**

Lake Recovery: Cost Benefit Analysis

Potential Contributions. Quality Level:Swimming. Quetzales 1996. Current Prices

Value	Industry	Hotels	Small Entreprises	Visitors	Residents	Total
Option	1.336.000	1.353.876	882.000	2.940.000	3.165.000	9.677.076
Existence	786.000	790.200	168.000	5.880.000	6.330.000	13.954.200
Total	2.122.000	2.144.076	1.050.000	8.820.000	9.495.000	**23.631.276**

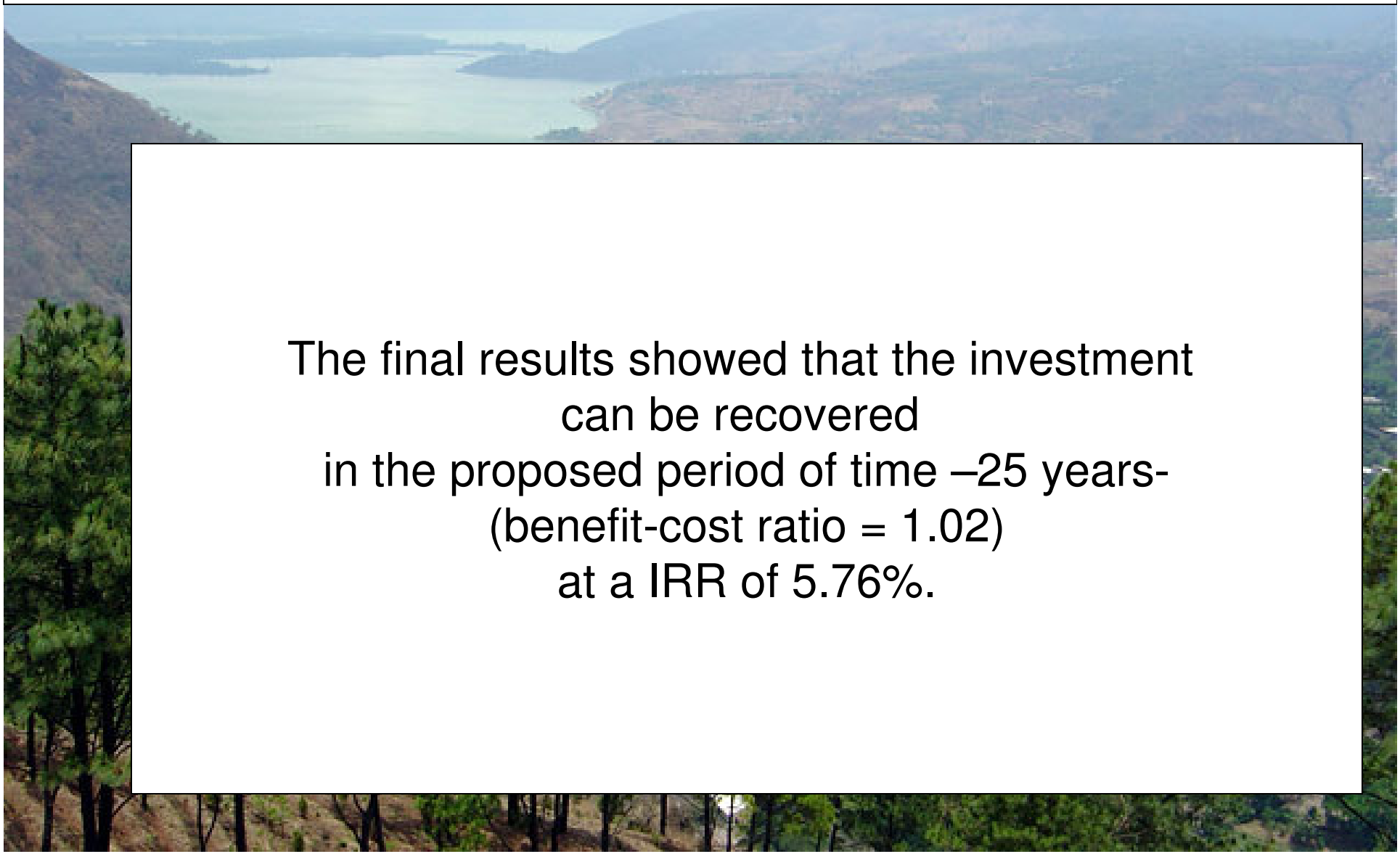
Expenditures

Environmental education programmes:	Q. 15.000.000
Urban planning:	Q.1.500.000.000
Operation:	Q. 350.000.000
Quality control and management:	Q. 12.000.000
Total:	Q.1.877.000.000

Income Generation. -25 Years-

	Year
Use Value	1-25
Contributions – 70%-	2-5
Contributions – 100%-	6-25
30% benefit increment	9-25
Residual Value	25

Recovery Programme
Cost-Benefit Analysis
Results



The final results showed that the investment
can be recovered
in the proposed period of time –25 years-
(benefit-cost ratio = 1.02)
at a IRR of 5.76%.

“Lago Peten Itza”, the largest lake in the region,
(the second largest in the country).
is some 32 km long and 5 km wide.
Peten Itza Lake has the island town of Flores,
capital of the Department of the Peten,

High levels of migration.
Existence of natural resources :
wood, chewing gum, oil,
and agricultural and pasture activities.
Archeological richness .
About 150000 turists
pass through the region yearly.

Petén Itzá Lake

Methodology for Valuation.

It was assumed
the use value
of the lake
to be mainly touristic.

The methodology
is concentrated
on a double-purpose survey.

Estimation of:
Lake's demand and
the willingness to pay for its
use and/or recoveration
by local and foreign tourists.

Use value :
Touristic means
Cost Travel Method –TCM-.

Option and existence value:
Reflected from the survey
to tourists
and local stakeholders
Contingent Valuation Method
–CVM- .

The Travel Cost Method

Household production method
which combines market goods
–travel costs-
with a nonmarket good
– recreation at the lake side-.
It can be estimated
the demand of the lake,
and therefore its value.
The Total Value equals
the Travel Cost
and the Opportunity Cost
(it was assumed one visit yearly).
Y=P+T

Opportunity cost:
income proportion
not perceived by the tourist
during his or her stay at the lake.

Travel cost(*):
transportation costs,
and average expenditures
during the stay.

(*)adjusted according to the
real duration of the stay
at the lake.

Touristic Value of the Lake . Travel Cost Method. Adjusted Values to the Peten Itza Lake. US dollars -if not specified-.(1)

Origin	Daily expendi-tures	Opportu-nity cost	Daily transpor-tation cost	Duration of the stay	Total
US	58.31	79.33	51.83	1.86	352.41
Mexico	31.67	40.16	86.33	1.30	211.70
Central America	35.00	35.00	65.00	2.30	310.00
South America	80.20	40.16	135.36	1.15	294.08
Europe	52.93	44.7	119.96	1.60	348.14
Asia	55.00	66.66	126.81	1.21	300.65
Canada	65.83	44.43	107.08	3.27	710.7
Average					358.81
Tourists/year					102 150

Touristic Value of the Lake . Travel Cost Method. Adjusted Values to the Peten Itza Lake. US dollars-if not specified-.(2)

Origin	Daily expen-ditures	Opportunity cost	Daily transpor-tation cost	Duration of the stay	Total
National Tourists	31.92	28.59	21.55	2.30	188.75
National Tourists per year					48 500
Total Adjusted Value Foreign Tourists(millions					36.65
Total Adjusted Value National Tourists(millions)					9.15
Total Adjusted Value (millions)					**45.80**

Lake's Value at Local Level

Absorbtion value of the tourism into the local region:

The value was adjusted by excluding
opportunity and transportation costs.

The aim was to estimate how much
aggregate value absorbs the local economy
due to the recreative characteristics of the lake.

It was estimated at US $13.82 millions
which is about 30%
of the total touristic value of the lake reflected by the TCM

Contingent Valuation Method

Stakeholders	Willing-ness to pay	Decon-tamina-tion	Conser-vation	Decon-tamination Total	Conser-vation Total
Households	80%	21.00-Monthly	19.00-Monthly	2 419 200	2 188 800
Comercial Sector	88%	38.00-Monthly	31.00-Monthly	642 048	523 776
Local Tourists	82%	--	30.00-Yearly	--	1 180 800
Foreign Tourists	79%	--	65.00-Yearly	--	5 250 537
Total				3 061 248	9 143 913

Results

The Option
and Existence Value
presented by the CVM
shows an amount
of Q12.2 millions
which is equivalent
to US 1,55 millions.

The total Value
of the Peten Itza Lake
was estimated at
US $47.3 millions.

The total Value
of the Peten Itza Lake
at local level is
US $15.35 millions.

Conclusions

The first case presents
multiple use values of the Amatitlan lake.

The second case presents mainly touristic value
which made possible to apply the Travel Cost Method to the Peten Itza Lake.

The absolutely differences
in the monetary value of the lakes
can be partly explained by the different
income levels of stakeholders.

The Amatitlan Lake presented more sources of existence value
since its use is linked more to local stakeholders.

For the case of the Peten Itza Lake
it is evident that there is a lack of information
and therefore of consciousness
about the value and problematic of the lake.
It makes foreign tourists somehow indifferent
on conservation issues.

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Thanks for comments and questions!