



# Ecosystem Services Classification and Ecosystem Accounting: Practical Lessons from the Field

**Miroslav Honzák<sup>1</sup>, Glenn-Marie Lange<sup>2</sup> & Rosimeiry Portela<sup>1</sup>**

<sup>1</sup> Betty and Gordon Moore Center for Science and Oceans, Conservation International, Suite 500, Arlington, VA 22202, USA

<sup>2</sup> Global Partnership for Wealth Accounting and Valuation of Ecosystem Services (WAVES), Agriculture and Environmental Services Department, The World Bank, 1818 H St. NW, Washington, DC 20433, USA

**World Bank**



# Structure of the talk

Introduction

Context (SEEA EEA)

Existing classification systems

Methods

Examples of hybrid classification tables for Peru

Conclusions and next steps





## WEALTH ACCOUNTING AND THE VALUATION OF ECOSYSTEM SERVICES

# What is the role of WAVES?

*WAVES is a global partnership that aims to mainstream Natural Capital in development planning and national economic accounts in support of sustainable development.*



# WAVES Core Implementing Countries





# Philippines: Southern Palawan - the last frontier

Southern Palawan is home to many IPs & rich in natural resources & biodiversity

**BUT** is under pressure from

Commercial agriculture

Mineral extraction

Poaching

Unsustainable fisheries

Deforestation & forest degradation



**How can these competing resource uses be managed to achieve sustainable & inclusive growth?**

# Philippines: Laguna Lake basin – center of economic activity

The Laguna Lake basin is a vital ecosystem

Water supply, fisheries, agriculture, forestry,  
flood retention & ecotourism

**BUT** is at risk from pollution & sedimentation  
due to

Unfiltered sewage & solid waste

Pollution from aquaculture

Pesticide use in agriculture

Degradation of the watershed

Siltation of tributaries



**What economic instruments could help  
manage these different uses?**



# Guatemala – seeking to understand the real contribution of natural capital

- How can we guarantee **land availability for crops and forests for ecosystem services**, including water production in the face of economic growth and social development?
- How can we guarantee **water availability for agriculture, industry, and residential use** when economic growth and demographic change place greater pressures on the country's natural base?
- Which environmental services are available to **enhance our adaptability to climate change**, and how can we reinforce them through public policy?
- How do we **achieve sustained growth**, without compromising our natural capital base?



How can we inform policies for addressing these issues?

# Botswana – managing resources and biodiversity

Protected areas account for 40 percent of Botswana's land area

Ecosystem accounts are developed to influence the benefits of tourism reaching local communities and can balance land usage



**How can we inform management of eco-tourism in four key ecosystems: Okavango, Chobe, Makgadikgadi Pans, and Central Kalahari.**



# ECOSYSTEM VALUES ASSESSMENT & ACCOUNTING (EVA):

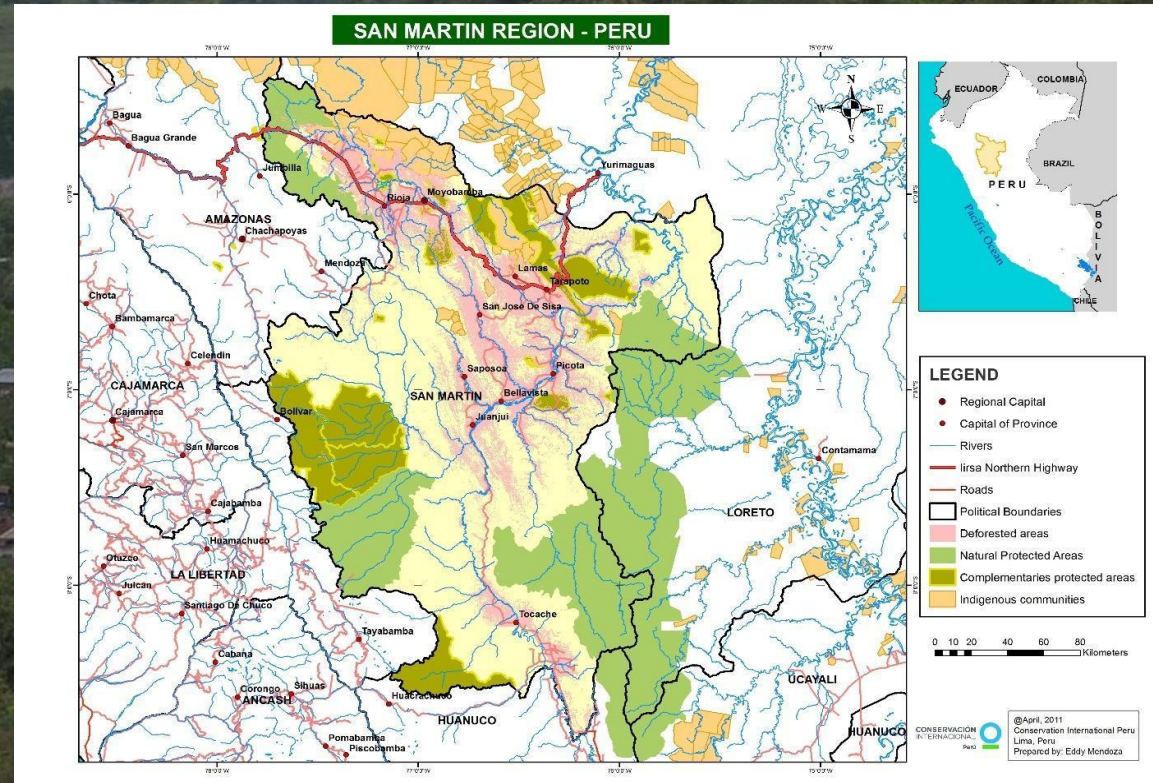
## PILOTING EXPERIMENTAL ECOSYSTEM (EEA) IN SAN MARTIN, PERU

### Goals:

- to design and field-test a replicable and scalable framework for incorporating nature's benefits into decision-making
- to make explicit the relevance of natural capital to the economy and inform more sustainable policies and practices

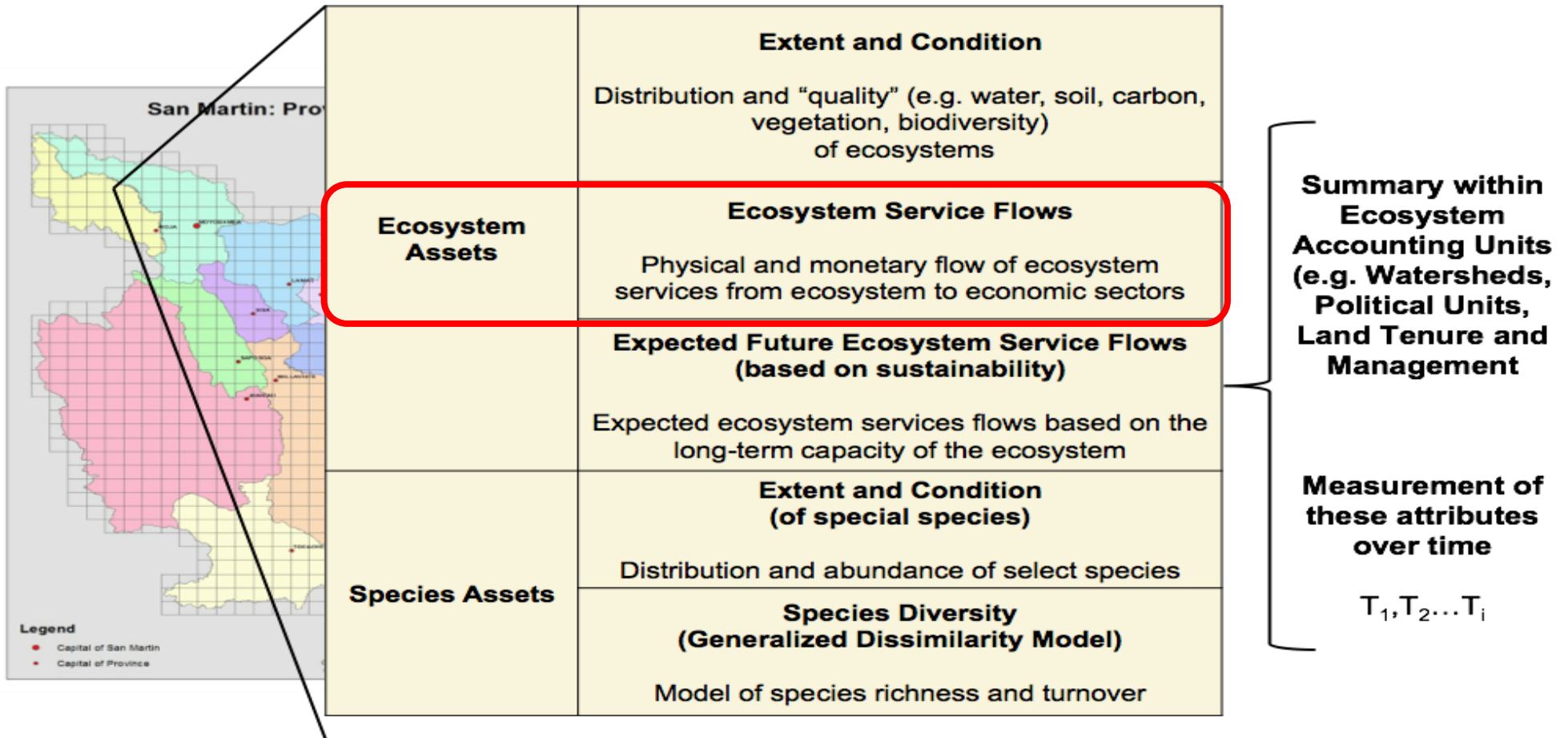
Funded by: the Moore Foundation

Implemented by: CI MCSO, CI Peru with support from GoP and San Martin





# Elements of Ecosystems and Species Assets Accounts





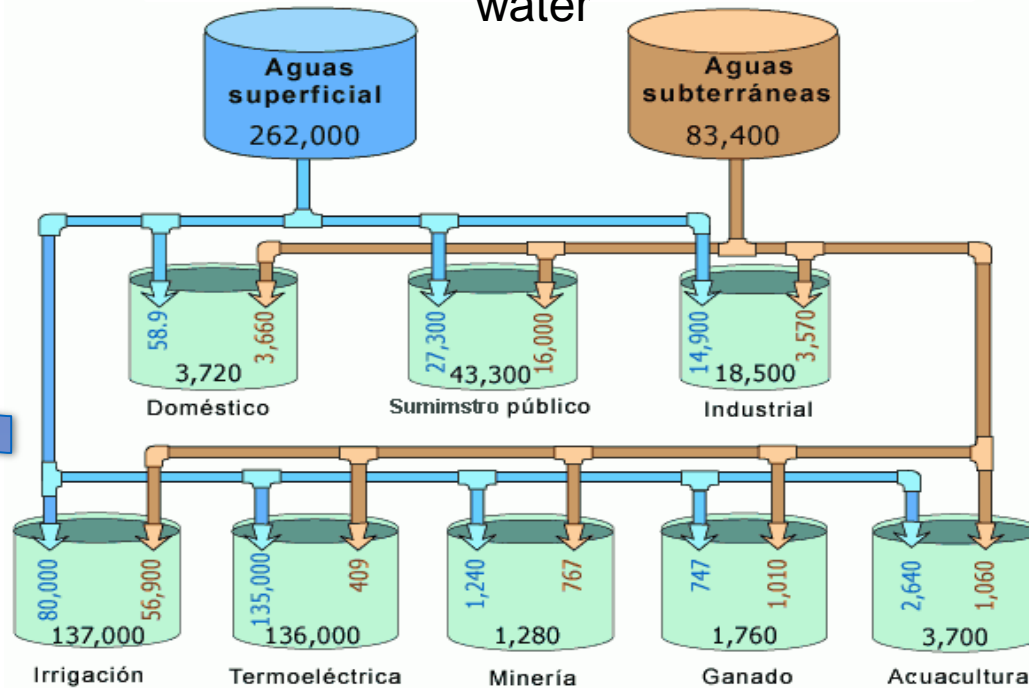
# Flow Tables

- Linking **economic sectors** to **ES** (e.g., provision of fresh water) (Table 1)
- Linking **ecosystems** to **ES** to (e.g., provision of fresh water) (Table 2)

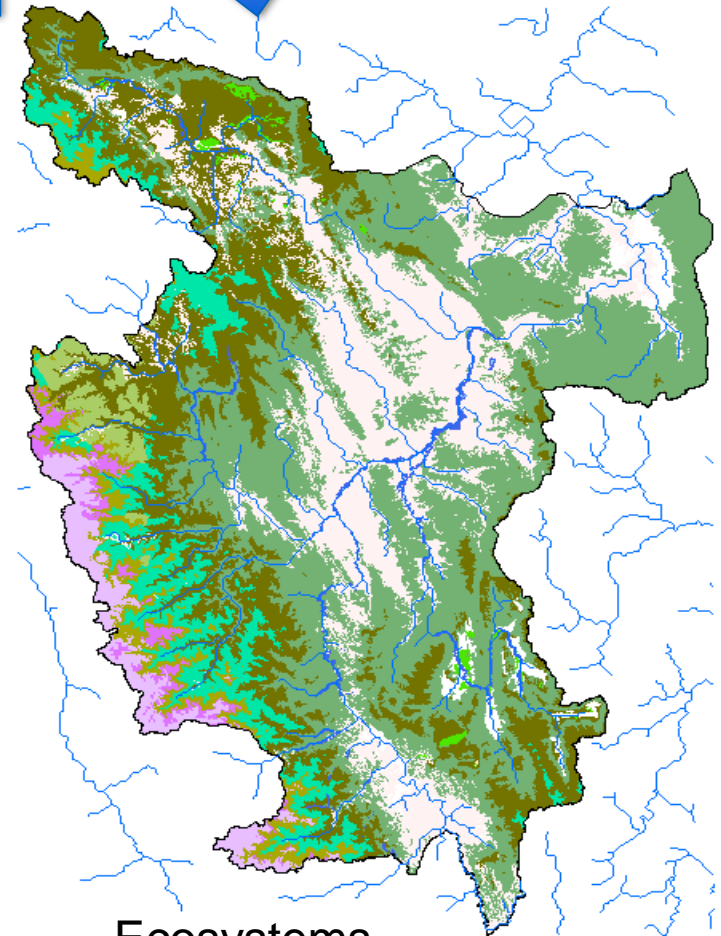
Table 1

Table 2

Provision of fresh  
water



Economic sectors



Ecosystems

# Stock Table: Change in ES Flows

		Ecosystem Assets			
		Palm swamp forest			
		Timber		Non-Timber forest resources	
		Physical	Monetary	Physical	Monetary
<b>Opening stock of resources in 2009</b>		1000	90	900	88
Additions to stock of ecosystem assets		10	2	100	0
	Managed expansion				
	Natural expansion				
	Upward reappraisals				
Total additions to stock of ecosystem assets		10	2	100	0
Reductions in stock of ecosystem assets		-100	-10	-50	-10
	Managed regression				
	Natural regression				
	Downwards reappraisals				
Total reductions in stock		-100	-10	-50	-10
<b>Closing stock of resources in 2014</b>		910	82	950	78



# Example: Rice Irrigation

Sources of water



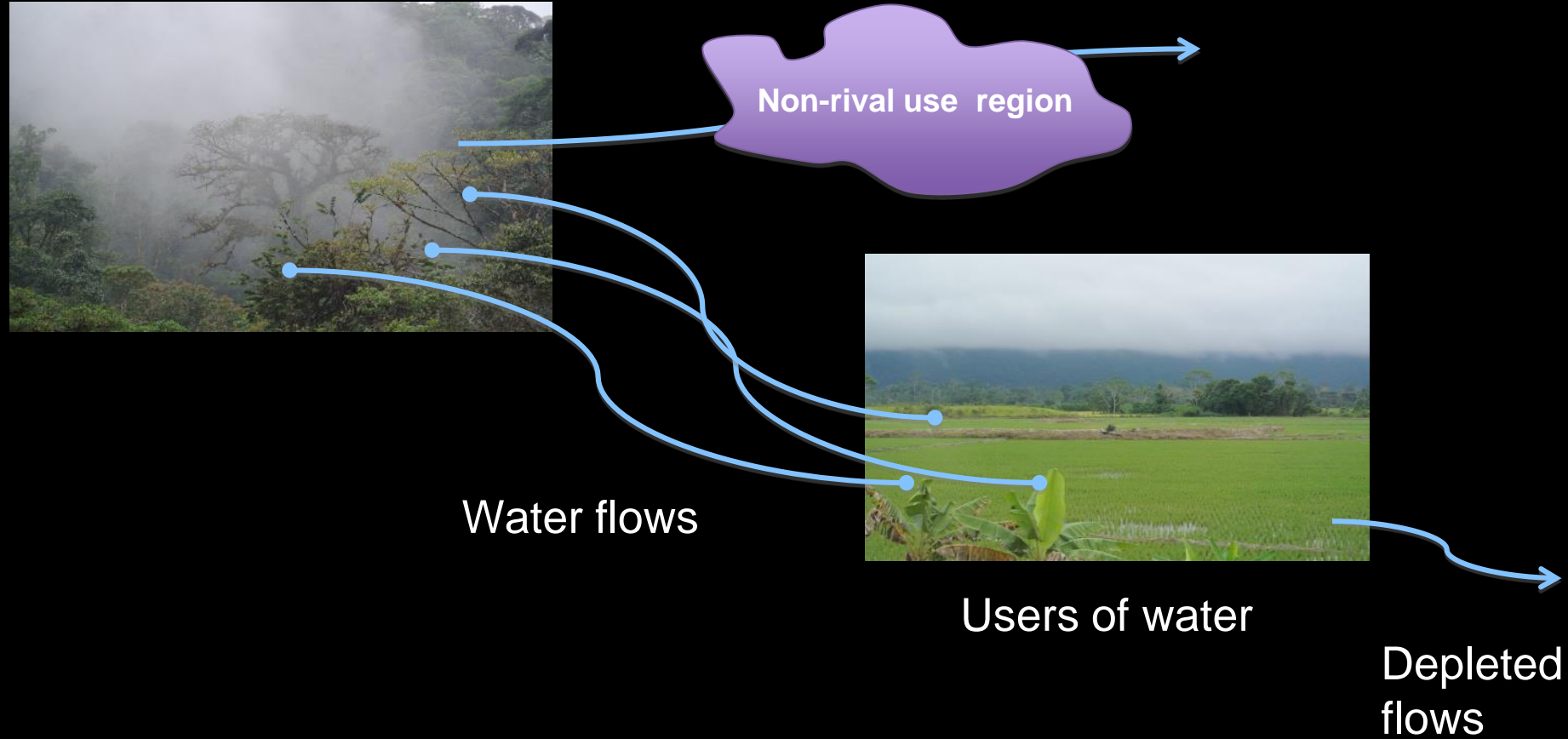
Non-rival use region

Water flows



Users of water

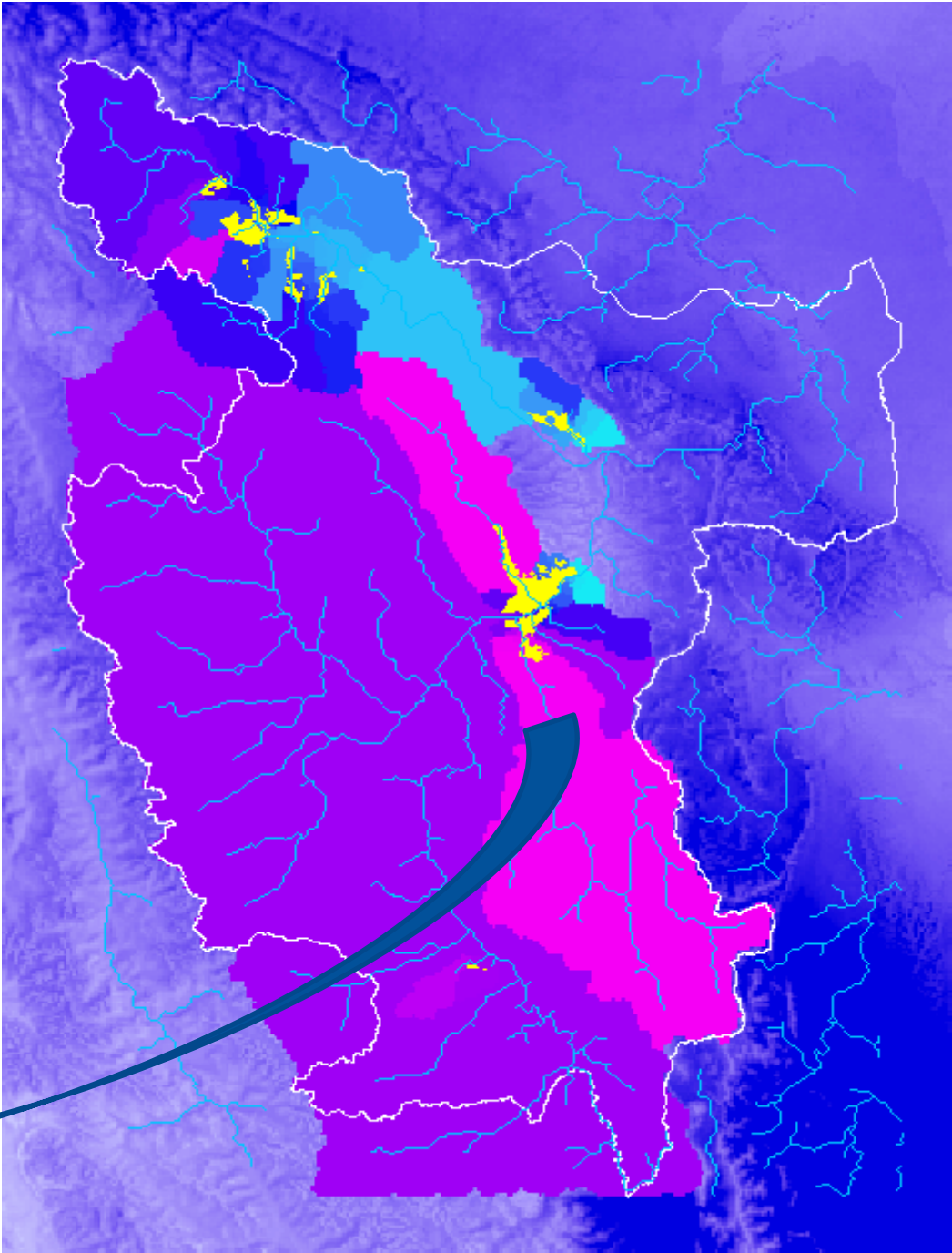
Depleted flows



# Example of Table 2:

Quantity of water used for irrigation of rice

2014	Ecosystem Accounting Units (political region, watershed, land management zone, tenure etc			
Ecosystem services	e.g., Watershed X			
	Economic sectors			
	Economic sector (rice irrigation)		Economic sector ...	
	Physical quantity	Monetary quantity (\$)	Physical quantity	Monetary quantity (\$)
Timber resources				
Non-timber forest products				
Pollination				
Water provision (km3/y)	200	...	...	...
Sediment control				
...				

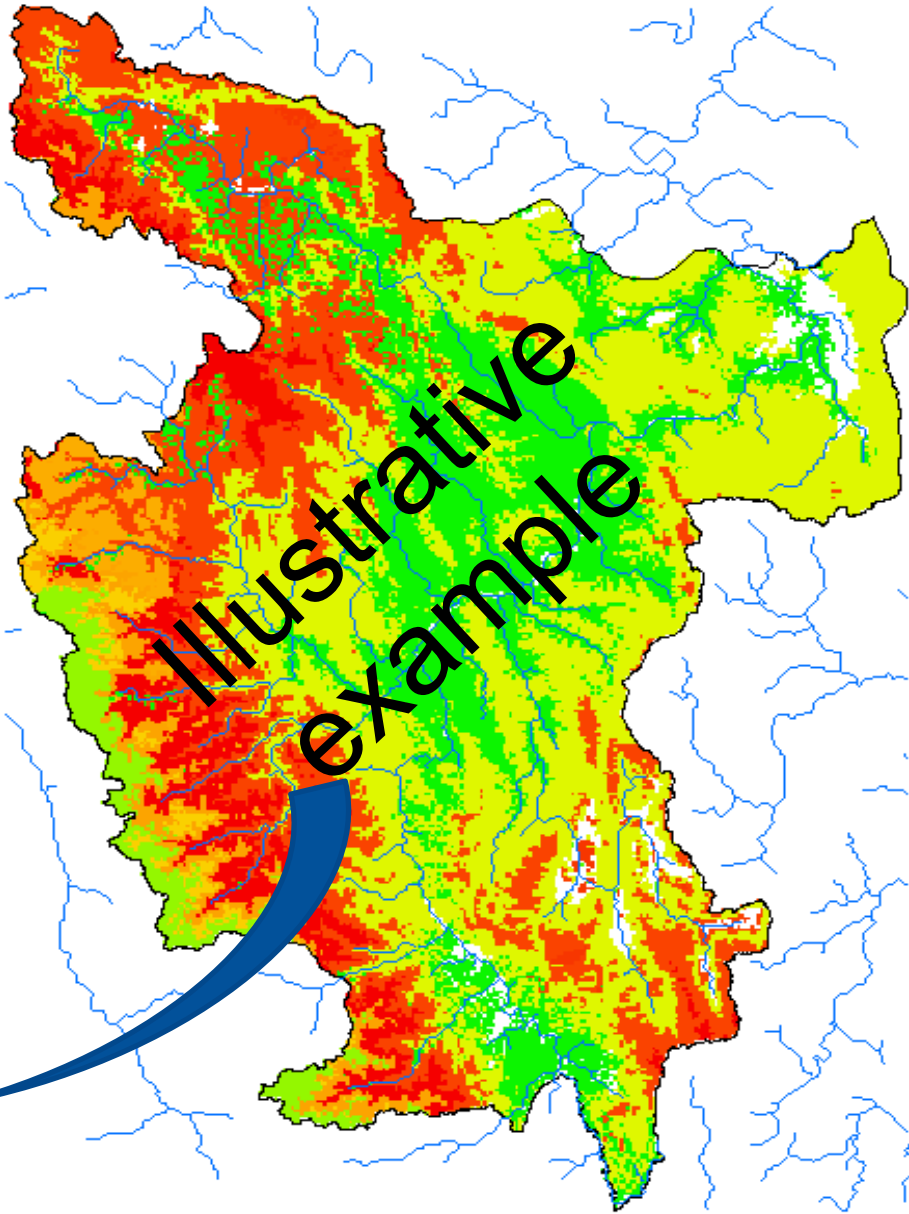




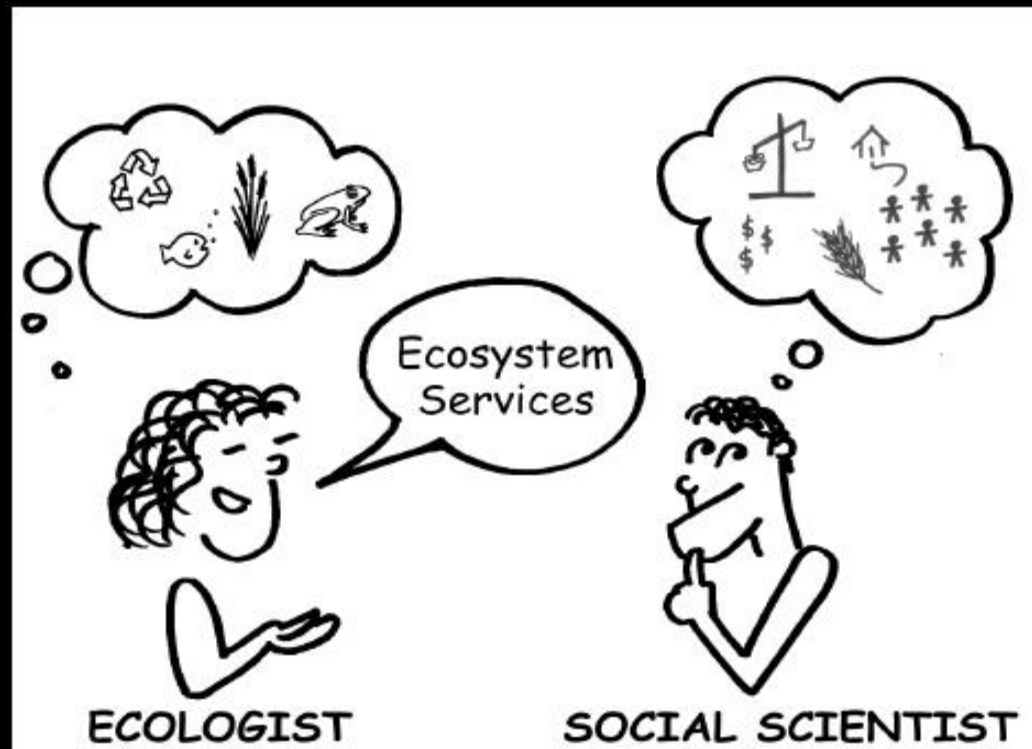
# Example of Table 1:

Quantity of water provided by ecosystems to irrigate rice (km3/y)

2014		Ecosystem Accounting Units (political region, watershed, land management zone, tenure etc			
Ecosystem services		e.g., Watershed X			
		Ecosystem Assets			
		Swamp forest	Shrub thicket	Lowland forest	...
Timber resources	Physical quantity				
	Monetary				
Water provision	Physical quantity (km3/y)	12	5	15	...
	Monetary				
...	Physical quantity				
	Monetary				



The services quantified by ecologists are not necessarily those directly valued by the public.



Connecting ecosystem services to benefits requires interdisciplinary approaches.



# **Common International Classification of Ecosystem Services (CICES): Consultation on Version 4, August-December 2012**

Report to the European Environment Agency



*Revised January 2013*

**EEA Framework Contract No:**

EEA/IEA/09/003

## Hierarchical structure of CICES V4.3

Section

Provisioning

Division

Nutrition

Materials

Energy

Group

Biomass

.....

....

....

....

....

Class

Cultivated crops

...

Class type

Cereals

....

....



## CICES version 4.3, three digits level

Section	Division	Group
Provisioning	Nutrition	Biomass
		Water
	Materials	Biomass, Fibre
		Water
	Energy	Biomass-based energy sources
		Mechanical energy
Regulation & Maintenance	Mediation of waste, toxics and other nuisances	Mediation by biota
		Mediation by ecosystems
	Mediation of flows	Mass flows
		Liquid flows
		Gaseous / air flows
	Maintenance of physical, chemical, biological conditions	Lifecycle maintenance, habitat and gene pool protection
		Pest and disease control
		Soil formation and composition
		Water conditions
		Atmospheric composition and climate regulation
Cultural	Physical and intellectual interactions with ecosystems and land-/seascapes [environmental settings]	Physical and experiential interactions
		Intellectual and representational interactions
	Spiritual, symbolic and other interactions with ecosystems and land-/seascapes [environmental settings]	Spiritual and/or emblematic
		Other cultural outputs



United States Environmental Protection Agency  
Office of Research and Development

# A Final Ecosystem Goods and Services Classification System (FEGS-CS)

Dixon H. Landers and Amanda M. Nahlik

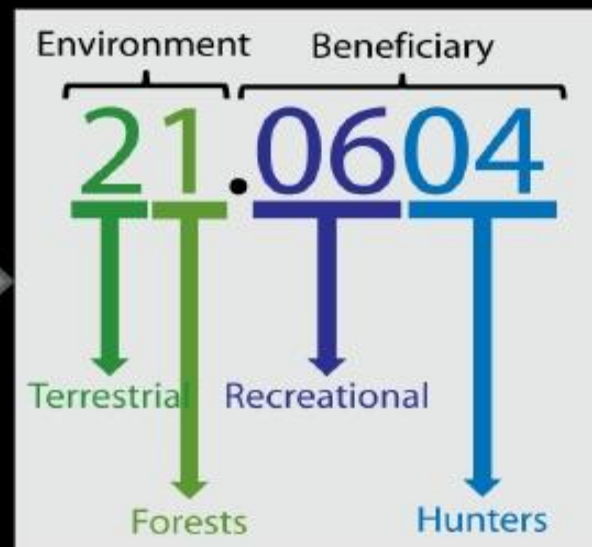
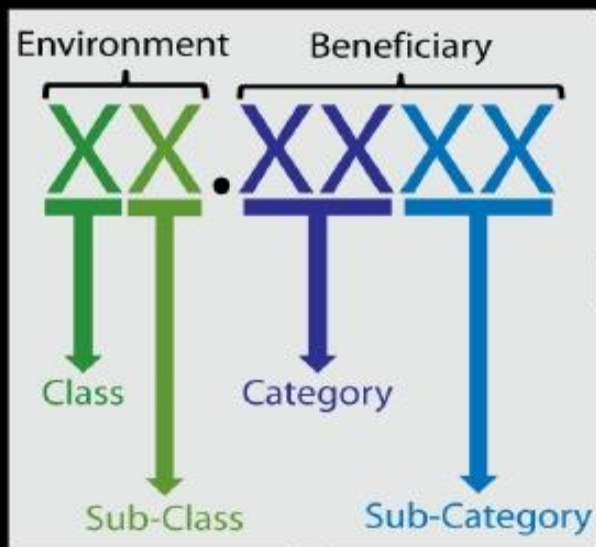
US EPA OFFICE OF RESEARCH AND DEVELOPMENT, NATIONAL HEALTH  
AND ECOLOGICAL EFFECTS RESEARCH LABORATORY, WESTERN  
ECOLOGY DIVISION, CORVALLIS, OREGON



# Our Classification Scheme

## FEGS Classification Structure

X	Environmental Class
XX.	Environmental Sub-Class
XX.XX	Beneficiary Category
XX.XXXX	Beneficiary Sub-Category



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Available Classifications  
 Alternate structures  
 Alphabetical Indexes  
 Correspondence Tables  
 Registry entries (corrections,  
 case laws, ...)  
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International Family of  
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ISIC Rev.4  
 ISIC Rev.3.1  
 ISIC Rev.3  
 CPC Ver.2  
 CPC Ver.1.1

[Printer friendly version](#)[English](#) [Français](#) [Español](#)**Available Classifications**

Click in the table to go to the complete structure of the classification in the selected language.

Classification	Language		
<b>Activity Classifications</b>			
ISIC Rev.4	<a href="#">English</a>		
ISIC Rev.3.1	<a href="#">English</a>		<a href="#">Español</a>
ISIC Rev.3	<a href="#">English</a>	<a href="#">Français</a>	<a href="#">Español</a>
ISIC Rev.2	<a href="#">English</a>	<a href="#">Français</a>	
ISIC Rev.1	<a href="#">English</a>		
<b>Product Classifications</b>			
CPC Ver.2	<a href="#">English</a>		
CPC Ver.1.1	<a href="#">English</a>	<a href="#">Français</a>	<a href="#">Español</a>
CPC Ver.1.0	<a href="#">English</a>	<a href="#">Français</a>	<a href="#">Español</a>
CPCprov	<a href="#">English</a>	<a href="#">Français</a>	<a href="#">Español</a>
SITC Rev.4	<a href="#">English</a>		
SITC Rev.3	<a href="#">English</a>	<a href="#">Français</a>	<a href="#">Español</a>
BEC	<a href="#">English</a>	<a href="#">Français</a>	<a href="#">Español</a>
<b>Classifications of Expenditure According to Purpose</b>			
COFOG	<a href="#">English</a>	<a href="#">Français</a>	<a href="#">Español</a>
COICOP	<a href="#">English</a>	<a href="#">Français</a>	<a href="#">Español</a>
COPNI	<a href="#">English</a>	<a href="#">Français</a>	<a href="#">Español</a>
COPP	<a href="#">English</a>	<a href="#">Français</a>	<a href="#">Español</a>
<b>Other classifications</b>			
ICATUS	<a href="#">English</a>		

# International Standard Industrial Classification of All Economic Activities (ISIC), Rev.4

Statistical Papers  
Series M No. 4, Rev.4



## Broad classes of ISIC Rev.4

Section	Divisions	Description
A	01–03	Agriculture, forestry and fishing
B	05–09	Mining and quarrying
C	10–33	Manufacturing
D	35	Electricity, gas, steam and air conditioning supply
E	36–39	Water supply; sewerage, waste management and remediation activities
F	41–43	Construction
G	45–47	Wholesale and retail trade; repair of motor vehicles and motorcycles
H	49–53	Transportation and storage
I	55–56	Accommodation and food service activities
J	58–63	Information and communication
K	64–66	Financial and insurance activities
L	68	Real estate activities
M	69–75	Professional, scientific and technical activities
N	77–82	Administrative and support service activities
O	84	Public administration and defence; compulsory social security
P	85	Education
Q	86–88	Human health and social work activities
R	90–93	Arts, entertainment and recreation
S	94–96	Other service activities
T	97–98	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use
U	99	Activities of extraterritorial organizations and bodies

## Example of detailed structure of ISIC Rev.4

### Section A

### Agriculture, forestry and fishing

Division	Group	Class	Description
Division 01			Crop and animal production, hunting and related service activities
	011		Growing of non-perennial crops
		0111	Growing of cereals (except rice), leguminous crops and oil seeds
		0112	Growing of rice
		0113	Growing of vegetables and melons, roots and tubers
		0114	Growing of sugar cane
		0115	Growing of tobacco
		0116	Growing of fibre crops
		0119	Growing of other non-perennial crops
	012		Growing of perennial crops
		0121	Growing of grapes
		0122	Growing of tropical and subtropical fruits
		0123	Growing of citrus fruits
		0124	Growing of pome fruits and stone fruits
		0125	Growing of other tree and bush fruits and nuts
		0126	Growing of oleaginous fruits
		0127	Growing of beverage crops
		0128	Growing of spices, aromatic, drug and pharmaceutical crops
		0129	Growing of other perennial crops

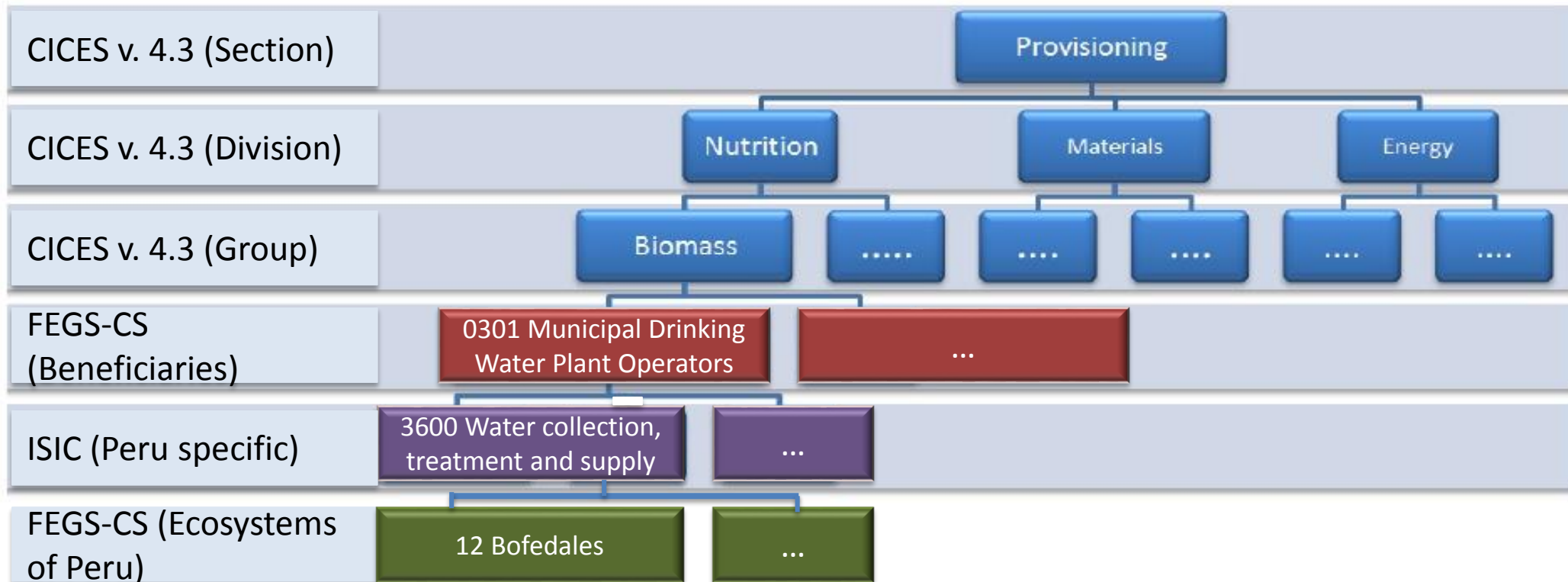
# The Central Product Classification (CPC) Ver.2

## Detailed structure and correspondences of CPC Ver.2 subclasses to ISIC Rev.4 and HS 2007

Group	Class	Subclass	Description	Corresponding	
				HS 2007	ISIC Rev.4
<b>Section 0</b>			<b>Agriculture, forestry and fishery products</b>		
<b>Division 01</b>			<b>Products of agriculture, horticulture and market gardening</b>		
<b>011</b>			<b>Cereals</b>		
	0111		Wheat		
		01111	Wheat, seed	1001.10*, .90*	0111
		01112	Wheat, other	1001.10*, .90*	0111
	0112		Maize (corn)		
		01121	Maize (corn), seed	1005.10	0111
		01122	Maize (corn), other	1005.90	0111
	0113		Rice		
		01131	Rice, seed	1006.10*	0112
		01132	Rice paddy, other (not husked)	1006.10*	0112
	0114		Sorghum		
		01141	Sorghum, seed	1007.00*	0111
		01142	Sorghum, other	1007.00*	0111
	0115		Barley		
		01151	Barley, seed	1003.00*	0111
		01152	Barley, other	1003.00*	0111
	0116		Rye		
		01161	Rye, seed	1002.00*	0111
		01162	Rye, other	1002.00*	0111
	0117		Oats		



# Method: Hybrid Table



# Fresh water provision

Goods and Benefits (CICES v.4.3)	Beneficiaries (FEGS-CS)	Economic Activities (ISIC Rev. 4)
Potable water supply	0301 Municipal Drinking Water Plant Operators	3600 Water collection, treatment and supply
	0206 Resource-Dependent Businesses	1101 Distilling, rectifying and blending of spirits
		1104 Manufacture of soft drinks; production of mineral waters and other bottled waters
	0501 Water Subsisters	3600 Water collection, treatment and supply
Non-potable water supply	0101 Irrigators	3600 Water collection, treatment and supply
	0102 CAFO Operators	1050 Manufacture of dairy products
	0103 Livestock Grazers	3600 Water collection, treatment and supply
	0104 Agricultural Processors	1030 Processing and preserving of fruit and vegetables
		1073 Manufacture of cocoa, chocolate and sugar confectionery
		1079 Manufacture of other food products n.e.c.
	0105 Aquaculturists	0322 Freshwater aquaculture
	0205 Electric and other Energy Generators	3510 Electric power generation, transmission and distribution
	0203 Industrial Processors (e.g., mining)	0899 Other mining and quarrying n.e.c.
	0203 Industrial Processors	1701 Manufacture of pulp, paper and paperboard
	0204 Industrial Dischargers	???

# Fresh water flow regulation

Goods and Benefits (CICES v.4.3)	Beneficiaries (FEGS-CS)	Economic Activities (ISIC Rev. 4)
Water flow regulation (drought and flood prevention)	0301 Municipal Drinking Water Plant Operators	3600 Water collection, treatment and supply
	0206 Resource-Dependent Businesses	1101 Distilling, rectifying and blending of spirits
		1104 Manufacture of soft drinks; production of mineral waters and other bottled waters
	0501 Water Subsisters	3600 Water collection, treatment and supply
	0101 Irrigators	3600 Water collection, treatment and supply
	0102 CAFO Operators	1050 Manufacture of dairy products
	0103 Livestock Grazers	3600 Water collection, treatment and supply
	0104 Agricultural Processors	1030 Processing and preserving of fruit and vegetables
		1073 Manufacture of cocoa, chocolate and sugar confectionery
		1079 Manufacture of other food products n.e.c.
	0105 Aquaculturists	0322 Freshwater aquaculture
	0205 Electric and other Energy Generators	3510 Electric power generation, transmission and distribution
	0604 Anglers	???
	0605 Waders, Swimmers, and Divers	8550 Educational support activities
	0606 Boaters	8541 Sports and recreation education
	0203 Industrial Processors	1701 Manufacture of pulp, paper and paperboard
	0203 Industrial Processors (e.g., mining)	0899 Other mining and quarrying n.e.c.
	0401 Transporters of Goods	5022 Inland freight water transport
	0402 Transporters of People	5021 Inland passenger water transport
	0303 Residential Property Owners	???



# Fresh water purification

Goods and Benefits (CICES v.4.3)	Beneficiaries (FEGS-CS)	Economic Activities (ISIC Rev. 4)
Water quality regulation (e.g., filtration of toxins and suspended matter)	0301 Municipal Drinking Water Plant Operators	3600 Water collection, treatment and supply
	0206 Resource-Dependent Businesses	1101 Distilling, rectifying and blending of spirits
		1104 Manufacture of soft drinks; production of mineral waters and other bottled waters
	0501 Water Subsisters	3600 Water collection, treatment and supply
	0101 Irrigators	3600 Water collection, treatment and supply
	0102 CAFO Operators	1050 Manufacture of dairy products
	0103 Livestock Grazers	3600 Water collection, treatment and supply
	0104 Agricultural Processors	1030 Processing and preserving of fruit and vegetables
		1073 Manufacture of cocoa, chocolate and sugar confectionery
		1079 Manufacture of other food products n.e.c.
	0105 Aquaculturists	0322 Freshwater aquaculture
	0604 Anglers (recreational)	???
	0605 Waders, Swimmers, and Divers	8550 Educational support activities
	0606 Boaters	8541 Sports and recreation education

# Erosion and sediment regulation

Goods and Benefits (CICES v.4.3)	Beneficiaries (FEGS-CS)	Economic Activities (ISIC Rev. 4)
Sediment and erosion regulation	0301 Municipal Drinking Water Plant Operators	3600 Water collection, treatment and supply
	0206 Resource-Dependent Businesses	1101 Distilling, rectifying and blending of spirits
		1104 Manufacture of soft drinks; production of mineral waters and other bottled waters
	0501 Water Subsisters	3600 Water collection, treatment and supply
	0101 Irrigators	3600 Water collection, treatment and supply
	0102 CAFO Operators	1050 Manufacture of dairy products
	0103 Livestock Grazers	3600 Water collection, treatment and supply
	0104 Agricultural Processors	1030 Processing and preserving of fruit and vegetables
		1073 Manufacture of cocoa, chocolate and sugar confectionery
		1079 Manufacture of other food products n.e.c.
	0105 Aquaculturists	0322 Freshwater aquaculture
	0205 Electric and other Energy Generators	3510 Electric power generation, transmission and distribution
	0203 Industrial Processors	1701 Manufacture of pulp, paper and paperboard
	0203 Industrial Processors (e.g., mining)	0899 Other mining and quarrying n.e.c.

# Provision of forest products

Goods and Benefits (CICES v.4.3)	Beneficiaries (FEGS-CS)	Economic Activities (ISIC Rev. 4)
Wild food (bush meat, fish, fruit, tubers, roots, medical plants, food supplements)	0502 Food Subsisters	0170 Hunting, trapping and related service activities
		0312 Freshwater fishing
	0207 Pharmaceutical and Food Supplement Suppliers	2100 Manufacture of pharmaceuticals, medicinal chemical and botanical products
Crops (e.g., coffee, cacao grown in natural areas)	0106 Farmers	A number for each crop growing activity
Timber (logs of coniferous and non-coniferous wood)	0107 Foresters	0210 Silviculture and other forestry activities
		0220 Logging
	0206 Resource-Dependent Businesses	0240 Support services to forestry
	0203 Industrial Processors	1701 Manufacture of pulp, paper and paperboard
NTFP (ornamental wood, animals and plants, fiber, furs, hides, feathers, latex)	0202 Timber, Fiber, and Ornamental Extractors	0230 Gathering of non-wood forest products
	0206 Resource-Dependent Businesses; Subsisters	1629 Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials
	0208 Fur / Hide Trappers and Hunters	0170 Hunting, trapping and related service activities
	0503 Timber, Fiber, and Fur / Hide Subsisters	0230 Gathering of non-wood forest products
Building and roofing materials	0504 Building Material Subsisters	4100 Construction of buildings
	0206 Resource-Dependent Businesses	3011 Building of ships and floating structures
Fodder	0107 Foresters	0119 Growing of other non-perennial crops



## Provision of forest products (cont.)

Goods and Benefits (CICES v.4.3)	Beneficiaries (FEGS-CS)	Economic Activities (ISIC Rev. 4)
Pollination and seed dispersal (e.g., coffee, cacao grown in natural and non-natural areas)	0207 Pharmaceutical and Food Supplement Suppliers	2100 Manufacture of pharmaceuticals, medicinal chemical and botanical products
	0206 Resource-Dependent Businesses	1101 Distilling, rectifying and blending of spirits
	0502 Food Subsisters	0170 Hunting, trapping and related service activities
		0312 Freshwater fishing
	0202 Timber, Fiber, and Ornamental Extractors	0230 Gathering of non-wood forest products
	0106 Farmers	A number for each crop growing activity

# Conclusions

1. Local stakeholder input and buy-in at all relevant levels is essential for the success of a project
2. Our hybrid table was adequate to describe the linkages between the economy and ecosystems and it was well received and understood by ecologist, statisticians and economists
3. It is a work in progress with new “species” of ecosystems, economic activities and standardized products may be incorporated depending on the local context

# Thanks!

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[mhonzak@conservation.org](mailto:mhonzak@conservation.org)