Radically changing the sustainable development paradigm for the Amazon

“The Amazonia Third Way Initiative”

Ismael Nobre, PhD
Research Team

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• Ismael Nobre, Human Dimensions of Natural Resources specialist
• Maritta Koch-Weser, Anthropologist
Calls for “an Amazon-specific Fourth Industrial Revolution innovation (4IR) “ecosystem” that is able to rapidly prototype and scale innovations that apply a combination of advanced digital, biological, and material technologies to the Amazon’s renewable natural resources, biomimetic assets, environmental services, and biodiverse molecules and materials”

The Amazonia Third Way initiative

(Nobre et al., 2016)
Technologies accessible from your pocket

• Smart machines
• Internet of Things
• Advanced sensors
• Cloud data
• Advanced computing
• Machine learning
• Voice command
• Etc.
Land Use in the Brazilian Amazon: the First Way and the Second Way
1990

- # Indigenous Lands: 54
  Area: 11 million ha

- # Protected Areas: 65
  Area: 33 million ha
2000

# Indigenous Lands – 212
Área – 69 million ha

# Protected Areas – 149
Área – 54 million ha
2005

- Indigenous Lands – 285
  - Area – 94 million ha

- Protected Areas – 238
  - Área – 84 million ha

**Categorías fundiarias criadas até 2005**
- Indigenous Lands
- Protected Areas
- Settlements of Agrarian Reform
- Protected Areas of the ARPA Project

**Límites**
- Límite Amazônia Legal
- Límite do Bioma Amazônia
- Área não florestal
- Desmatamento até 2005
2008

# Indigenous Reserves – 330
Area - 102 million ha

# Protected Areas – 274
Area – 119 million ha
2013

Indigenous Lands – 381
Area – 112 million ha

Protected Areas – 311
Area – 125 million ha
The 1st Way

• Protected Area-oriented
• Has shown expressive growth over time
• Good for forest intactness
The 2nd Way

• Forest degradation and annihilation
• But if deforestation is now under control...
Future land use change in the amazon will result in sustainability or fragmentation?
Weakening of policy of recent years

Declining deforestation rates

Scenarios of future deforestation to 2030

Deforested Area (%): 
-0.1 ~ 0.1
0.1 ~ 0.2
0.2 ~ 0.3
0.3 ~ 0.4
0.4 ~ 0.5
0.5 ~ 0.6
0.6 ~ 0.7
0.7 ~ 0.8
0.8 ~ 0.9
0.9 ~ 1.1

Source: PRODES – INPE and Aguiar et al., 2013
Are we good?

- Illegal deforestation
- Legal deforestation
- Political battles, corruption
- Etc.
A recent editorial of *Science Advances* by Thomas Lovejoy and Carlos Nobre warns that the Amazon may be close to a tipping point if deforestation exceeds 25% of the forest!
What is the potential of a biodiversity-driven bio-economy in the Amazon to produce viable value chains for food, nutraceuticals, cosmetics, fragrances, pharmaceuticals, industrial oils bio-industries?
Project Development

- Literature Review
- Field work
- Conceptualization
- Specific developments
- Test and stakeholder involvement for inputs and calibration
- Implementation (institutionalization, funding, fomenting, etc)
<table>
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<th>Scientific name</th>
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Research for assessing issues and opportunities for a “Third Way” based on non-timber products of biodiversity in the Brazilian Amazon.
Geographic distribution of 20 selected plant species with literature and modeling data

Rosewood (Aniba rosaeodora)

(Nobre et al., 2017, in preparation)
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Field study of 5 selected plant species regarding their Value Chains
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Field study of 5 selected plant species regarding their Value Chains

Brazil nut (Bertholletia excelsa)

Places of Extractivism or Agroforestry System
Research for assessing issues and opportunities for a “Third Way” based on non-timber products of biodiversity in the Brazilian Amazon.

Field study of 5 selected plant species regarding their Value Chains.

Brazil nut (Bertholletia excelsa)

Places of Value Aggregation
4700 Localities scattered over Brazilian Amazon territory

towns (orange), villages (pink), settlements (red), agrovilages (white) and Indian villages (green),

(IBGE 2017)
A novel sustainable development paradigm based upon harnessing biological and biomimetic assets of Amazon biodiversity
A big differential: the newest technologies

The **fourth industrial revolution** is marked by the convergence of digital, physical and biological technologies.
The theoretical density of DNA storage is so high that only 4 grams of it could store 1.8 zettabytes, the total data that existed in the world in 2009.

Nitrogen-containing nucleobases (cytosine [C], guanine [G], adenine [A] or thymine [T]) are synthesized into polynucleotides: DNA.
Steam Locomotive Boiler
Supercritical CO2 Extraction Machine
SUSTAINABLE USE OF THE AÇAÍ PALM TREE
(EUTEÆPE SP.)
ARE THERE WAYS TO UTILIZE AMAZON BIODIVERSITY SUSTAINABLY?

The Açaí Fruit Case

Direct Economic Value of Açaí
over 250,000 tons/year
over US$ 1.6 billion/year

New uses: natural marker for plaque

Net Profitability from Açaí Production in the Amazon
Pará State: US$ 200 ha/year (unmanaged) to over US$ 2,000 ha/year (managed)

Jardim and Anderson (1987)
Hiraoka (1994a, 1994b)
Brondizio, E. (2007)
Costa F (2017)
A novel β-glucosidase isolated from the microbial metagenome of Lake Poraquê (Amazon, Brazil)


A β-glucosidase from an Amazon lake metagenome (AmBgl-LP) was recombinantly produced.

The enzyme was able to efficiently hydrolyze synthetic and natural substrates.

The β-glucosidase showed maximum activity at 40 °C and pH 6.0.

The crystal structure of AmBgl-LP revealed a novel dimeric configuration.
(1) the recognition of existing Natural knowledge/technology;
(2) the ability for learning from Nature;
(3) the capacity to applying biodiversity-based knowledge to human needs;
(4) the capacity to produce biodiversity-based goods and solutions;
(5) the insertion of biodiversity-originated products on a local-to-global bioeconomy;
(6) the fair sharing of socioeconomic benefits and life quality improvement for all; and
(7) the raising of the Amazon Biome’s intrinsic value by local and global societies.
Capacity Development and the Amazon Creative Labs

The Amazonia Third Way Initiative
Technologies accessible from your pocket

• Smart machines
• Internet of Things
• Advanced sensors
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• Advanced computing
• Machine learning
• Voice command
• Etc.
Amazon Creative Labs*

• Developing capacities for biodiversity-driven, inclusive socioeconomic transformations in the Amazon

• Transportable field laboratories on tents or on floating platforms for innovative experimentation in smaller communities

• Providing a unique environment for problem-solving innovations based on a four-pronged approach: collaboration, knowledge sharing, experimentation and open spaces for citizens

*conceptual development phase
The training activities can be directed to providing capacity for the local communities to gather more information on the natural resources available to them, including the use of high-end technologies.

With the assistance of technology experts, on one hand, and entrepreneurship specialists, on the other hand, groups of participants from Amazonian villages, towns and cities would be invited to develop new applications and to prototype (at least digitally) such innovations.
The main target audience should be a blend of two kinds:

• Young undergraduate or just graduated students interested in innovation to create new, sustainable businesses in the Amazon;
• Forest people living in forest, riverine communities and agroforestry farmers already engaged on a biodiversity-based economy or willing to start activities in that realm.

For these communities, the exposure to 4IR technologies would allow innovative concepts to emerge which would make use of such technologies. The blend of these two communities would also give rise to new partnerships.
ACL - Amazon Creative Labs

BIODIVERSITY VALUE CHAINS

CUPULATE EDITION

Amazon Socio-biodiversity

Nutraceutical Cupulate

Mobile Hi-tech Training Lab

Cupuacu Fruit

3D Food Printer for Cupulate Form & Content

+ Bacuri Fruit: C vitamin super source

Cocoa-like Cupuacu Seeds
The Earth BioGenome Project

Target: Genome sequencing of about 1.5 million known species in 10 years.
ACL - Amazon Creative Labs
GENOMICS

Amazon Sociobiodiversity

Accessible DNA decoding

Mobile Hi-tech Training Lab

Benchtop Electron Microscope

Portable Genome Sequencer
WE NEED A NEW SUSTAINABLE DEVELOPMENT PARADIGM FOR THE TROPICAL FORESTS

Science and technology must offer solutions for the emergence of an innovative, knowledge-based standing forest-flowing rivers economy and local bioindustries

Along with empowerment and quality, inclusive education for all the forest people
Conclusions

• A3W can foster forest intactness:
• No logging
• SAFs (agroforestry systems) on deforested land can coupe with high market demands for biodiversity products
• Technology help to control extraction of inputs from the forest (sensors, traceability) along with advanced training for best management practices
• Valuing forest products: Good economy x Bad economy
• Good wins, locals increase their socioeconomic level, all the people benefits from products and knowledge from the forest
• Locals and other people strongly demand forest protection
“To add value to the heart of the forest”

Bertha Becker
Brazilian geographer
Thanks

nobreismael@gmail.com