

WATER POLICY AND BIOENERGY IN BRAZIL

Three Case Studies from Brazil

*Márcia
Moraes*

*UFPE
Brazil*

Bioenergy and Water Workshop: Developing strategic priorities for sustainable outcomes.
Thurs 20th and Friday 21st February.
UNEP, Paris, France

BIOENERGY AND WATER NEXUS IN BRAZIL

*Liquid biofuels
important
elements of the
renewable energy
portfolio*

*Brazil plays a
major role in the
world's biofuel
economy.*

*Brazil could
expand its
biofuel
production
potential using
its vast amount
of pasture lands.*

*Less attention
has been given to
water resources.*

UNIQUE ASPECTS OF BIOENERGY- WATER RESOURCE SYSTEMS

Replacing the traditional, fragmented approach to water resources management with a more holistic approach will be essential to understanding and managing a number of unique aspects of bioenergy-water resource systems.

INTEGRATED IMPACT ASSESSMENT: CASE STUDIES IN BRAZIL

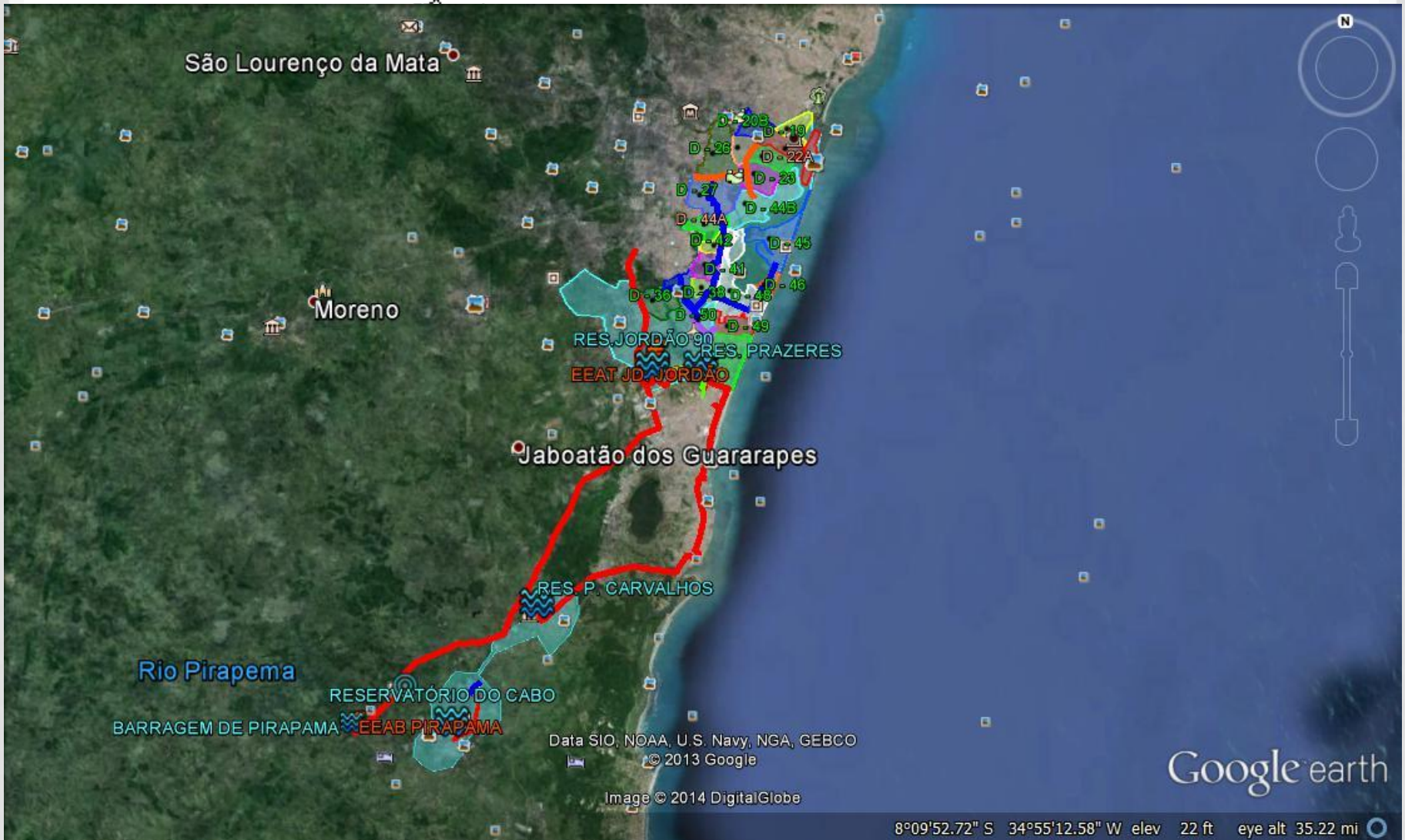


*Integrated water quantity-quality
management;*

*Integrated economic concepts for water
allocation – Hydro-economic modeling;*

*Challenges to bioenergy production
related to water resource limitations*

INTEGRATED WATER QUANTITY-QUALITY MANAGEMENT: PIRAPAMA RIVER BASIN IN NORTHEASTERN BRAZIL



RESULTS OF THE INTEGRATED MODELING: PIRAPAMA RIVER BASIN IN NORTHEASTERN BRAZIL

*The water
quantity-
quality
model*

*Evaluates the impact of
enforced water pollution
standards on fertirrigation;*

*Incorporates water quality
aspects into water allocation
decisions leading to a
substantial reduction in
application of vinasse to
sugarcane fields by the users;*

*For instance, the largest agro-
industry no longer allocates all
effluents to sugarcane areas*

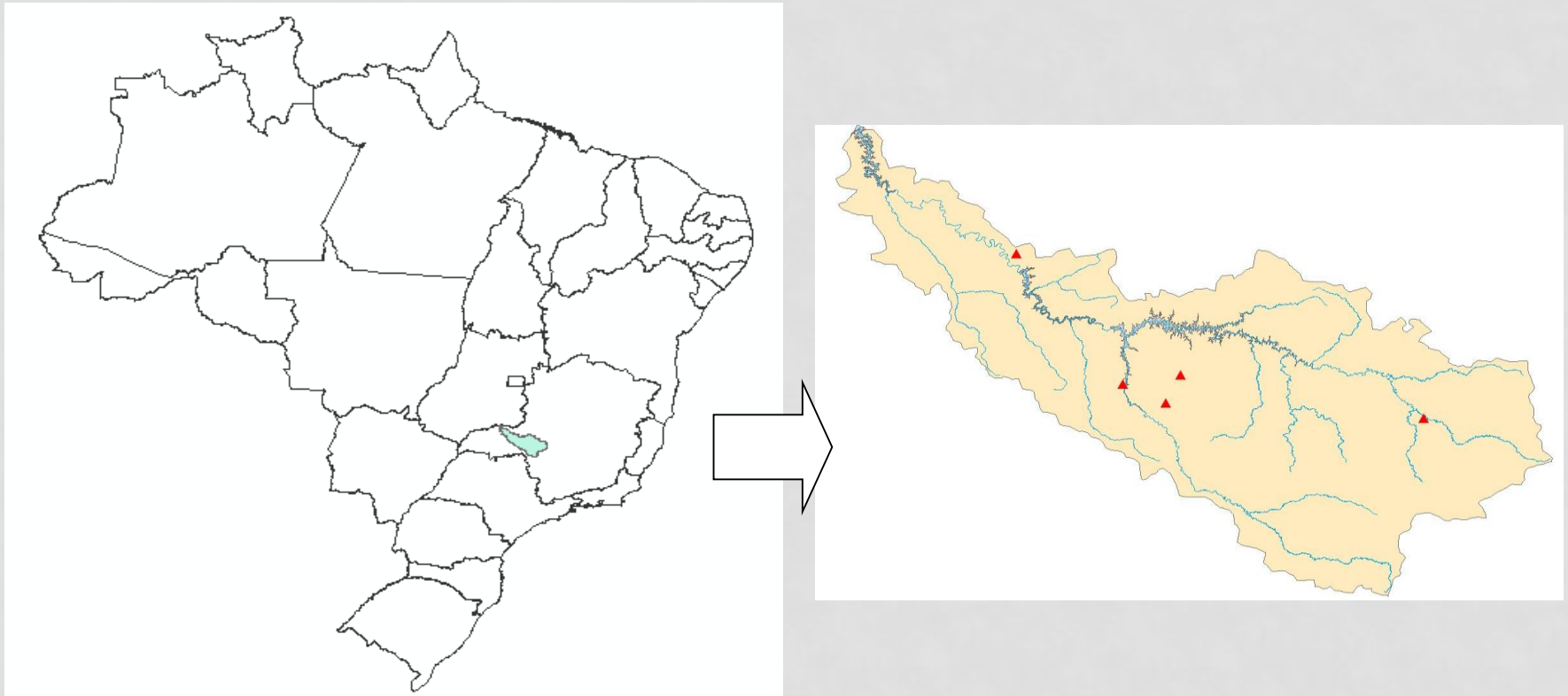
*Net benefits also decline for
other water users*

ECONOMIC RESULTS OF THE INTEGRATED MODELING: PIRAPAMA RIVER BASIN IN NORTHEASTERN BRAZIL

The model identified the shadow price for maintaining higher volumes of water in the reservoir to avoid the eutrophication process.

How much less it should be transportations costs for the agro-industries to sent these residues to the more distant sugarcane cultivation areas

**HYDRO ECONOMIC MODELING TO SUPPORT WATER POLICIES
UNDER ENERGY TRADEOFFS
AND CONFLICTS STEMMING FROM WATER ALLOCATION
ARAGUARI RIVER BASIN IN BRAZIL (MARQUES ET AL)**



- *The Araguari River watershed is part of a larger region that has undergone significant land use change in recent years, with the sugar cane area increasing from 226.4 thousand ha in 1999 to 495.9 thousand ha in 2008 (119% increase).*

HYDRO ECONOMIC MODELLING ARAGUARI RIVER BASIN IN BRAZIL

*While the sugar
cane is still largely
produced without
irrigation in Brazil,
significant
productivity gains
exist
with use of irrigation
(DALRI et al, 2008).*

*The reduction of the
potential future ethanol
deficit, especially with
an expected increase
in the irrigated area of
sugar cane,
may bring significant
impacts to the
producing watersheds,
with increased water
scarcity and economic
value.*

HYDRO ECONOMIC MODELLING ARAGUARI RIVER BASIN IN BRAZIL

The objective function minimizes the water's scarcity cost to users, subject to physical and legal constraints in the system



Negotiate water allocation among competing economic demands, especially the ones related to ethanol production



Supporte adaptive measures in watersheds where the production of ethanol is expected to increase, and



Calculate the effect of ethanol production on the water's availability and economic value.



**NEW APPROACHES FOR ASSESSING WATER POLICIES FOR
BIOENERGY:
AN ECONOMIC ANALYSIS OF LAND USE CHANGES AND
BIOFUEL FEEDSTOCK PRODUCTION IN BRAZIL(NUNEZ ET AL, 2013):
THE ROLE OF IRRIGATION WATER(CARNEIRO ET AL, 2014)**

Investigates the potential for biofuels feedstock production in Brazil considering the competition between food crops and sugarcane for limited land and water resources

A spatially explicit price endogenous mathematical programming mode; agricultural and transportation fuel sectors are simulated and equilibrium in commodity and fuel markets is determined in a simultaneous framework.

The model maximizes the sum of producers' and consumers' surpluses subject to regional land and water resource limitations, material balances, technical constraints, policy restrictions, and trade of food and fuel commodities with the rest of the world

A particular emphasis is given to the beef-cattle production and conversion of pastures to cropland through livestock intensification in Brazil.

AN ECONOMIC ANALYSIS OF LAND USE CHANGES AND BIOFUEL FEEDSTOCK PRODUCTION IN BRAZIL: THE ROLE OF IRRIGATION WATER



*Without
Water
constraints*

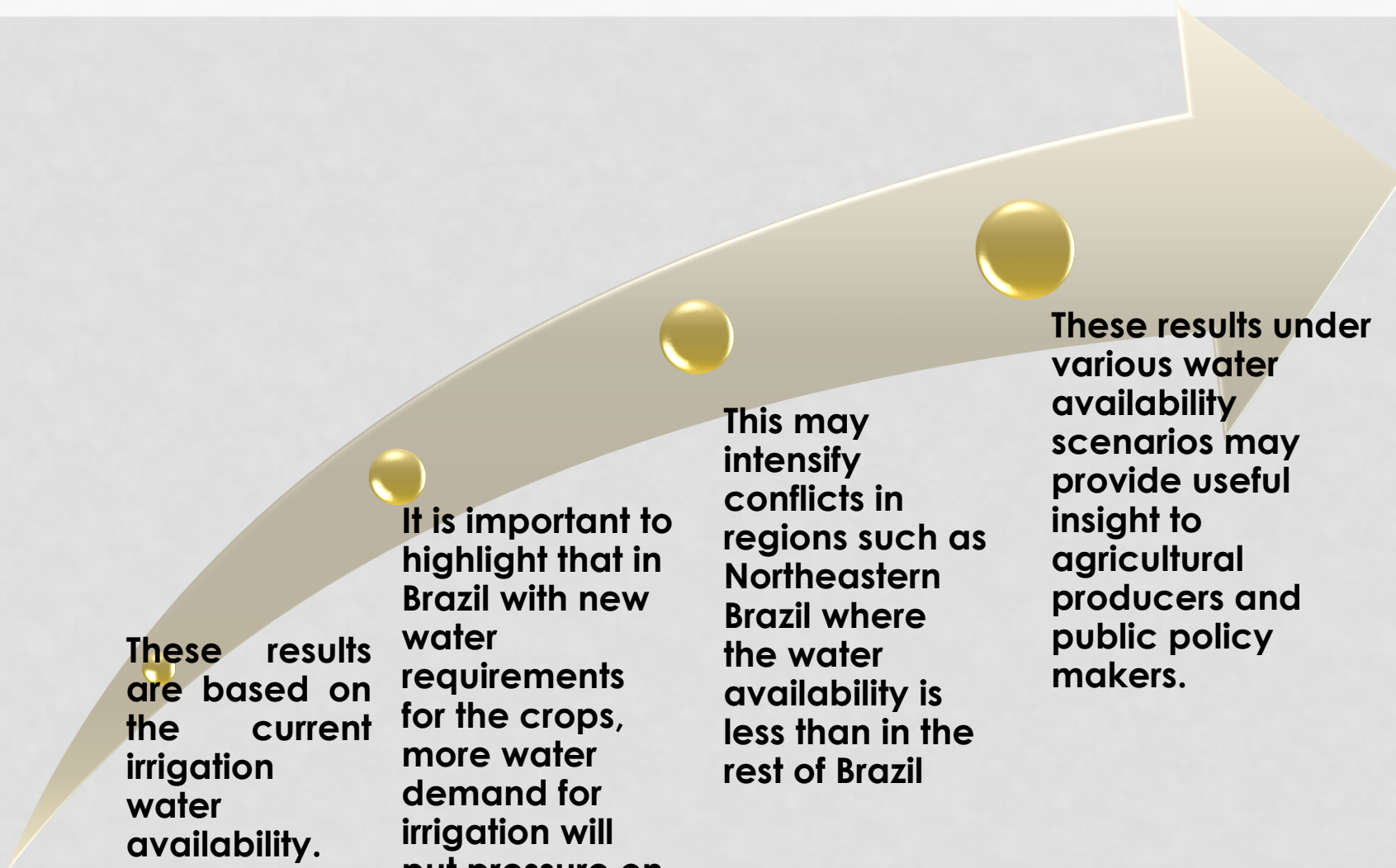
- i) 11.8 million hectares of pasture lands would be converted to cropland, of which
- ii) 4.3 million hectares would be allocated to sugarcane.



*With
Water
constraints*

The pasture conversion becomes much smaller, 9.5 million hectares, of which only 0.3 million hectares would be allocated to sugarcane

AN ECONOMIC ANALYSIS OF LAND USE CHANGES AND BIOFUEL FEEDSTOCK PRODUCTION IN BRAZIL: THE ROLE OF IRRIGATION WATER



These results are based on the current irrigation water availability.

It is important to highlight that in Brazil with new water requirements for the crops, more water demand for irrigation will put pressure on the other uses.

This may intensify conflicts in regions such as Northeastern Brazil where the water availability is less than in the rest of Brazil

These results under various water availability scenarios may provide useful insight to agricultural producers and public policy makers.

**RCN-SEES for Pan American
Biofuels and Bioenergy
Sustainability**

2014

<http://www.aiche.org/panamrcn/events/rcn-conference-on-pan-american-biofuels-and-bioenergy-sustainability>

THANKS!

