NATIONAL PROGRAM ASSESSMENT

AIR QUALITY

(203)

GLOBAL CHANGE

(204)

OUTLINE

- OUR CHARGE
- THE ASSESSMENT PANEL
- CRITICAL ARS RESEARCH NEEDS FOR THE FUTURE
- WHAT WE DID AND FOUND

Assessment Audience

- Customers, partners, and stakeholders
- ARS managers
- ARS scientists
- OMB

Overall Goal:
Assess Performance and Impact

- Provide feedback to customers, partners, and stakeholders focusing on accomplishments relative to promises made
- Evaluate progress of the current National Program
- Provide guidance on research directions related to potential goals for the next program cycle
- Evaluate the performance and impact of the research programs within the Agency and relative to OMB perspectives

ASSESSMENT PANEL (who we were)

- Academics
- Agri-business
- Other Federal Research Agency

- Specialties covered air quality, particulate emissions, remote sensing, greenhouse gas studies, ecosystem analysis, soil chemistry, land use

WHY ARS RESEARCH IS NEEDED

THE CHANGING WORLD VIEW
AND
THE ROLE OF AGRICULTURE RESEARCH

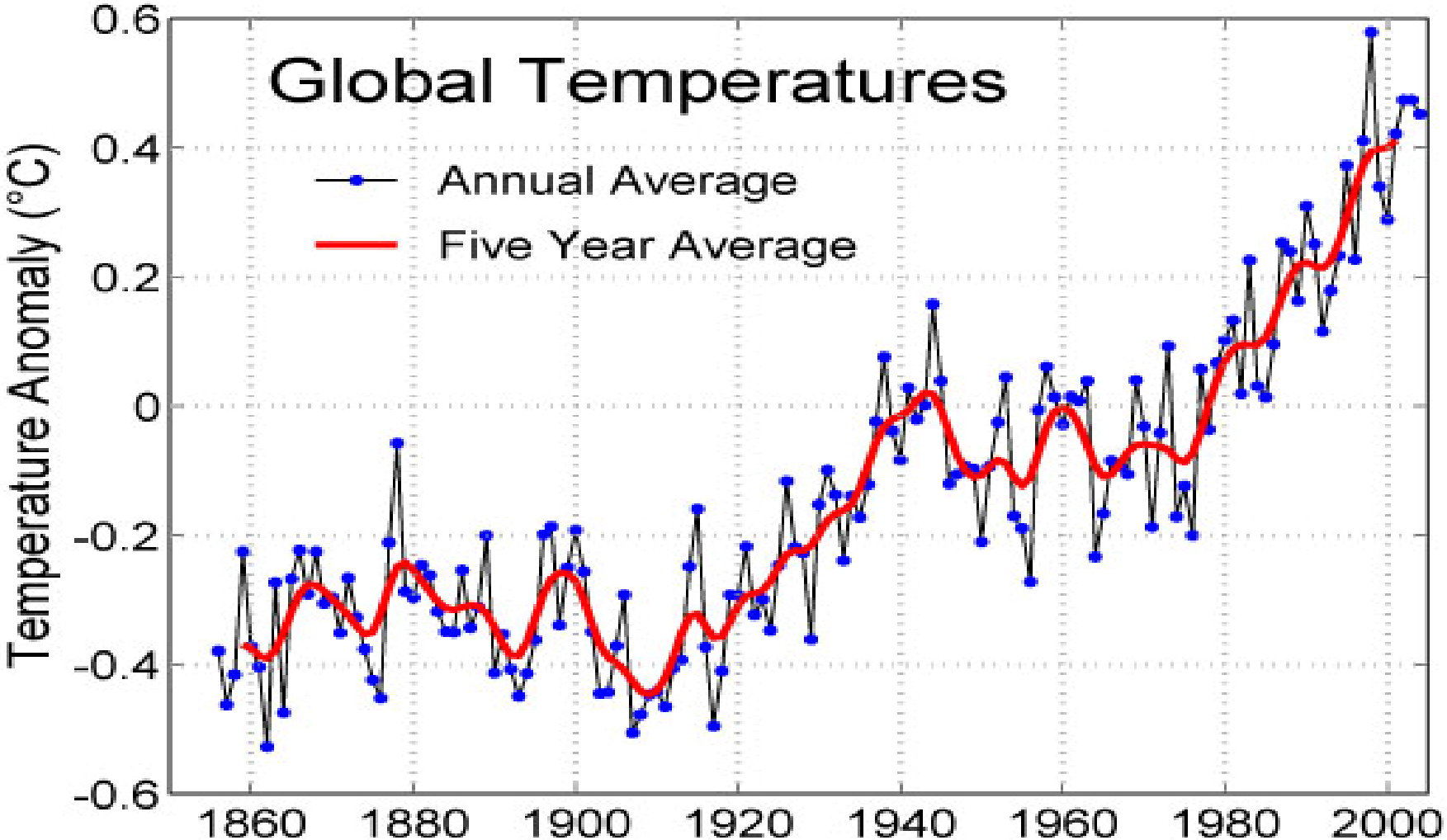
CRITICAL CONSIDERATIONS

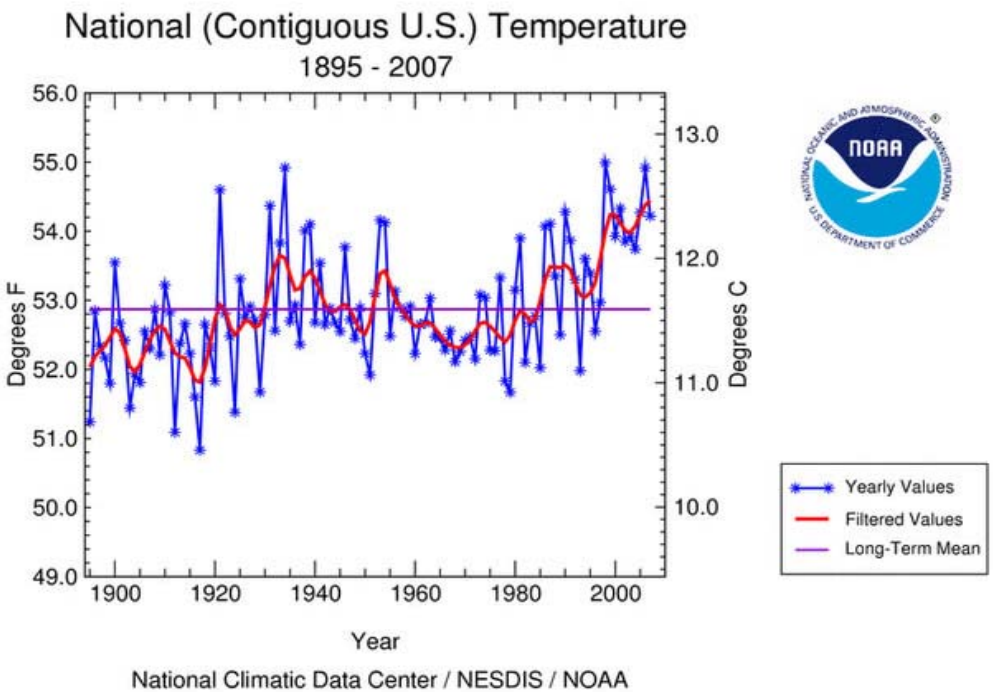
- CLIMATE CHANGE
- ENVIRONMENTAL QUALITY
- LAND USE CHANGE

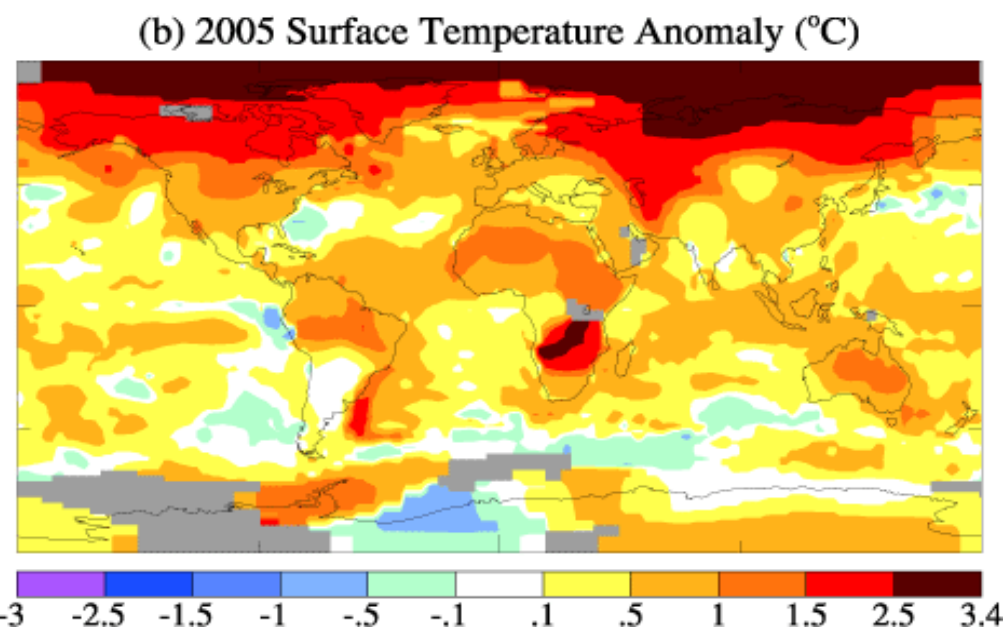
- FOOD SECURITY
- ENERGY SECURITY
- LANDSCAPE INTEGRITY

- ECONOMICS
- POLICY
- FAMILY VALUES

Measured Surface Temperature the past 150 years







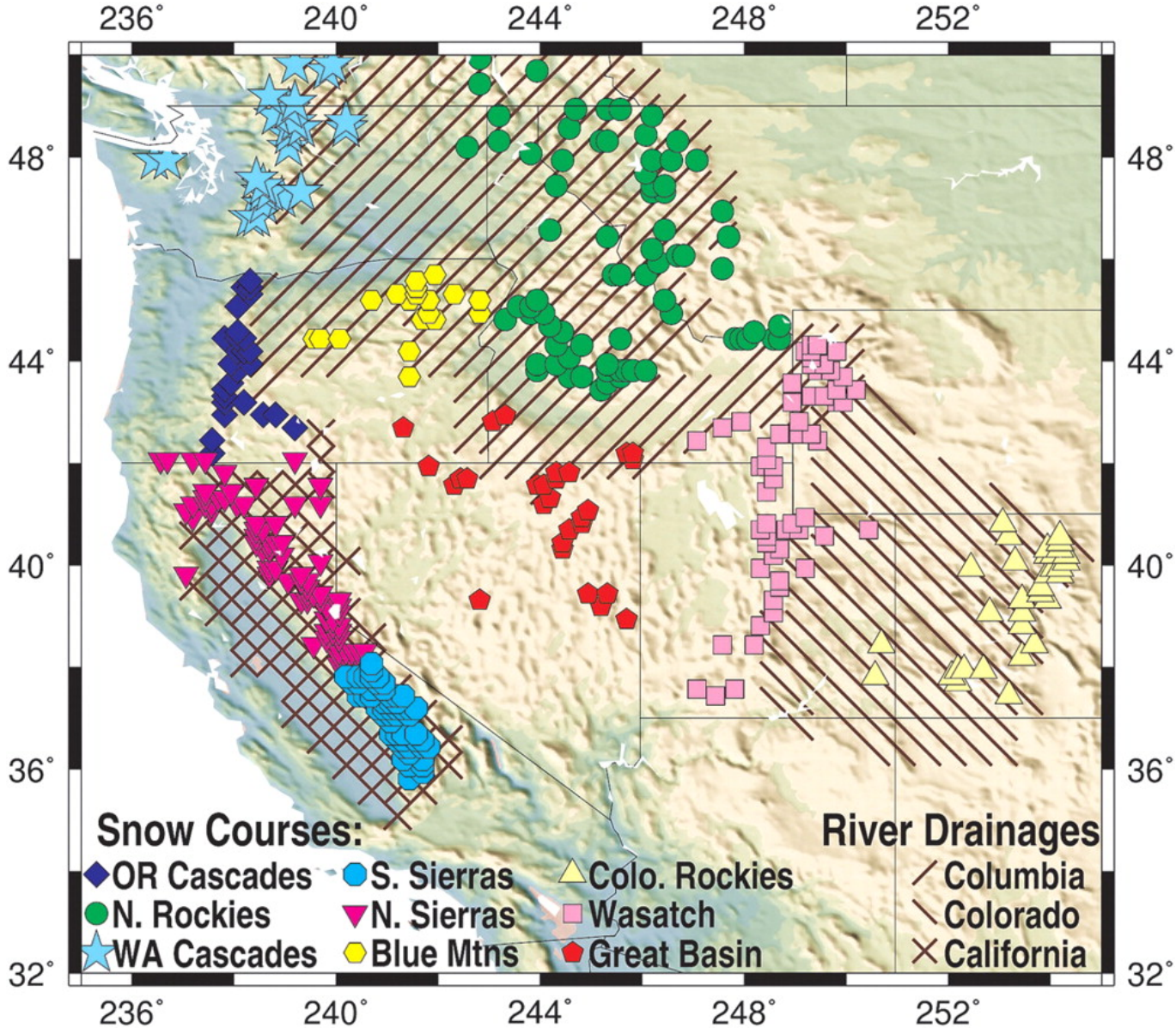
Warming greatest at high latitudes

2007 was 8th warmest year on record for lower 48 States of USA

Amplification of warming due to decrease of albedo (melting of snow and ice)

Globally, 7 of the 8 warmest years have occurred since 2001

Map showing averaging regions over which SWE/P and JFM Tmin were determined

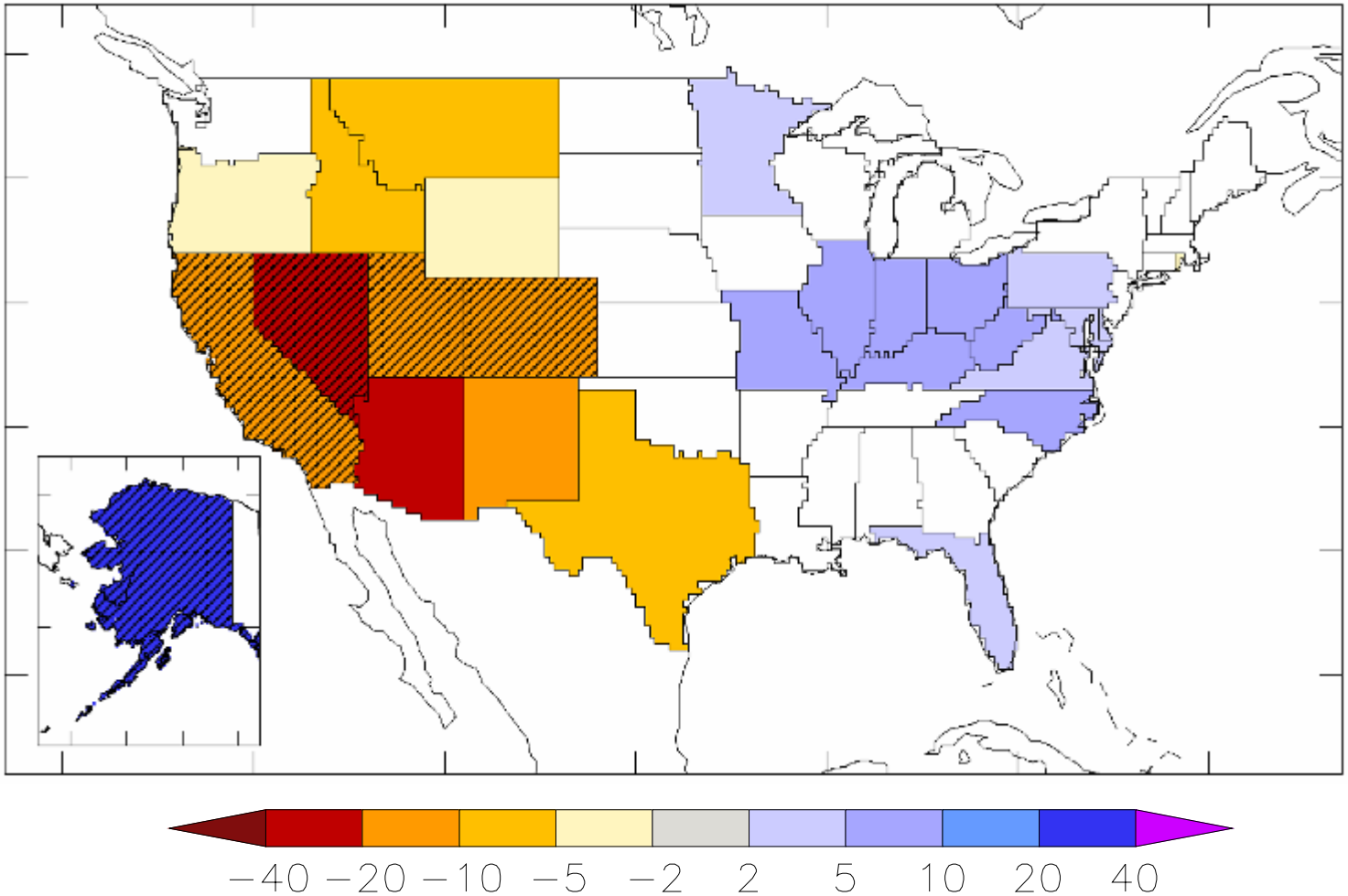


Published by AAAS

T. P. Barnett et al., Science 319, 1080 -1083 (2008)

Model-Projected Changes in Annual Runoff, 2041-2060

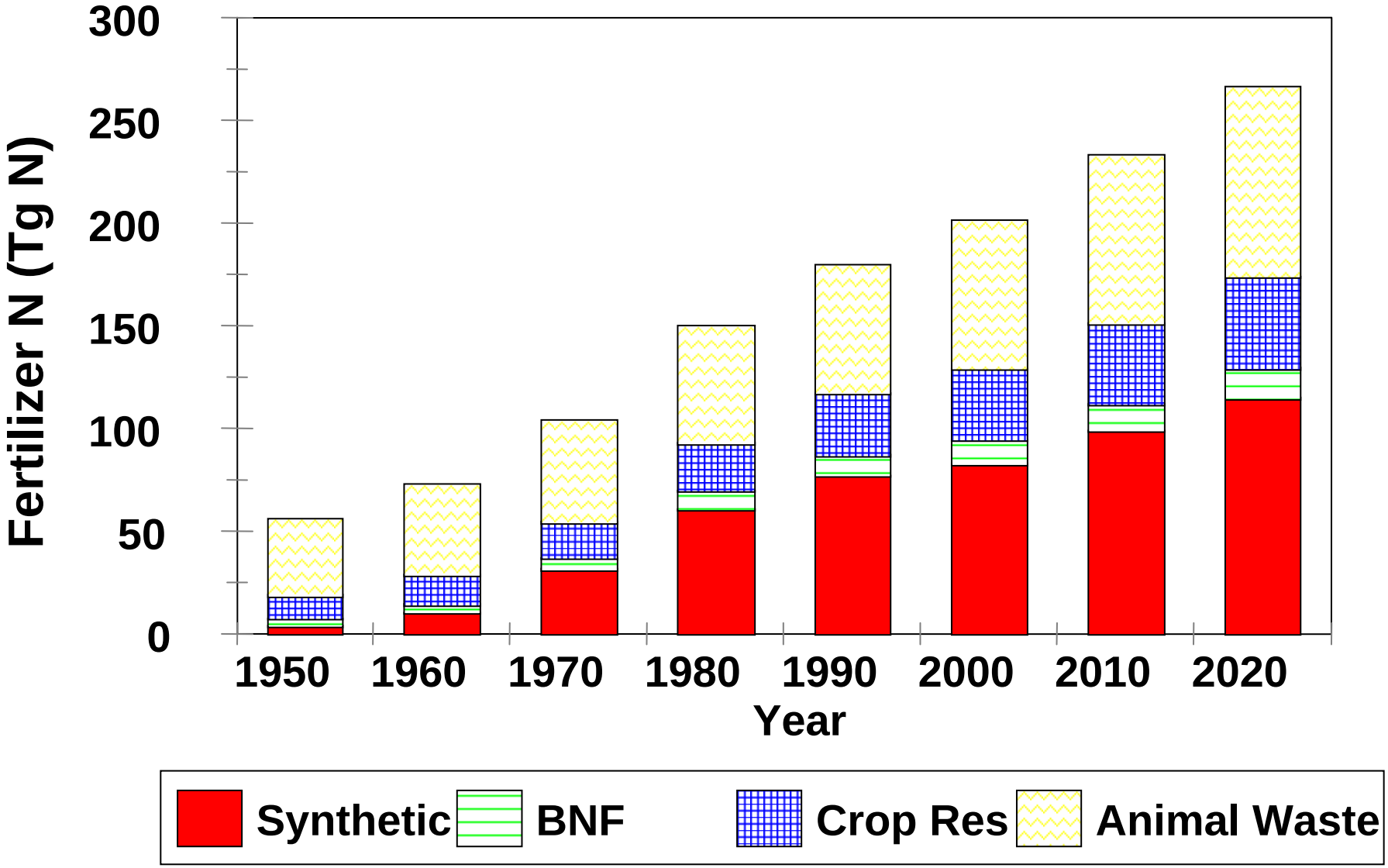
Percentage change relative to 1900-1970 baseline. Any color indicates that >66% of models agree on sign of change; diagonal hatching indicates >90% agreement.



USGS

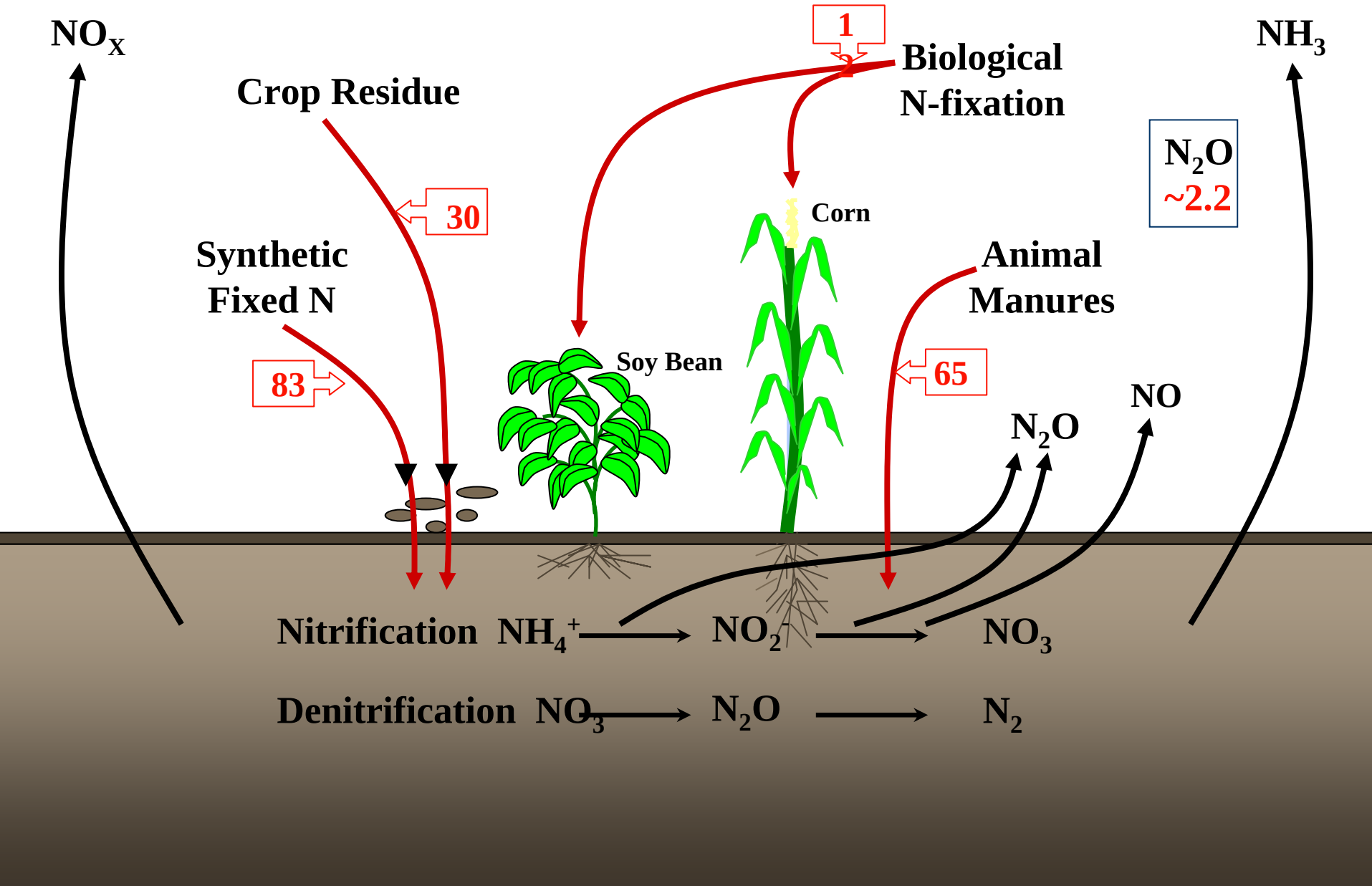
(After Milly, P.C.D., K.A. Dunne, A.V. Vecchia, Global pattern of trends in streamflow and water availability in a changing climate, *Nature*, 438, 347-350, 2005.)

Fertilier N Use Projections 1950-2020

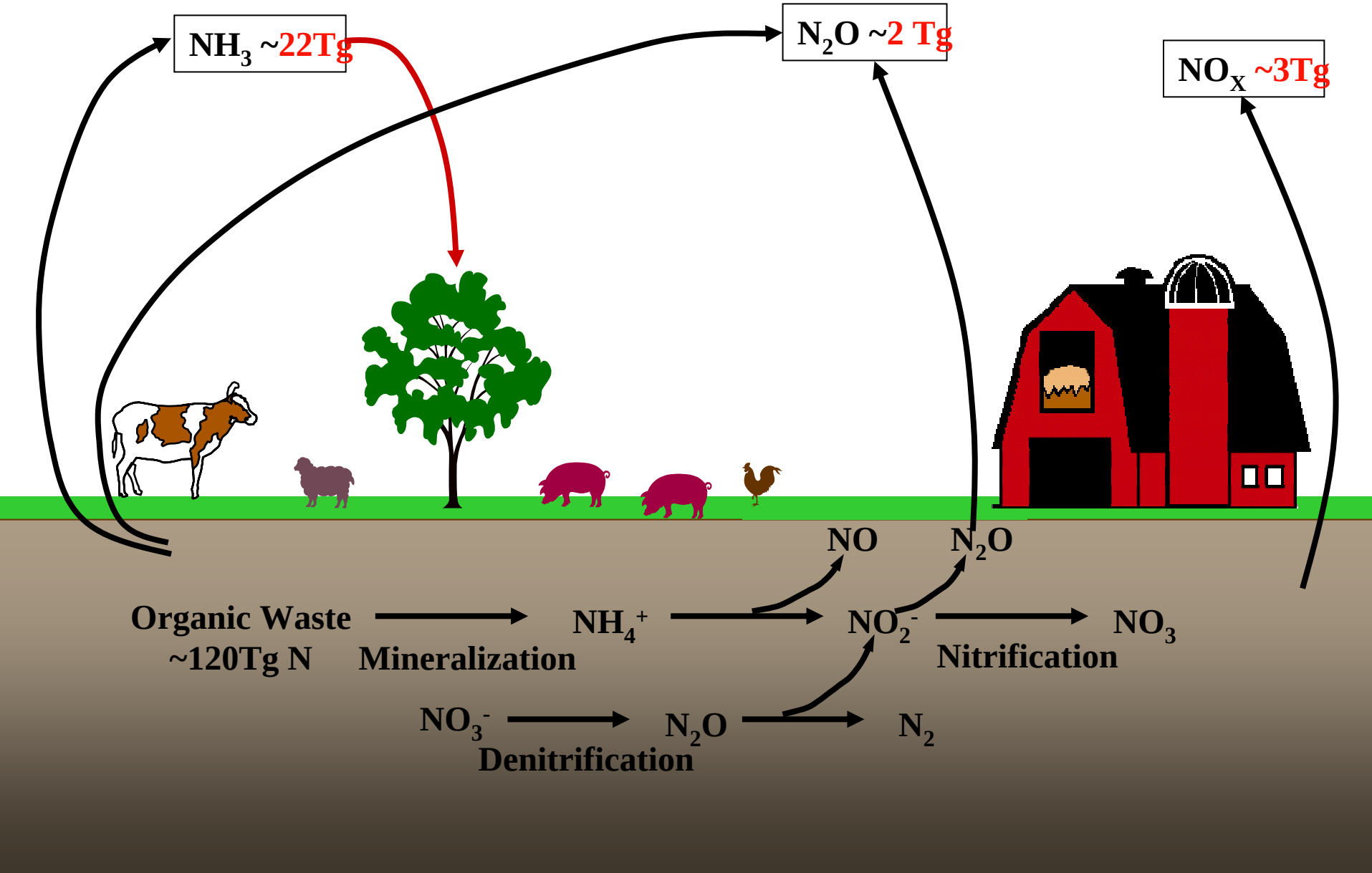


Estimate of Global N_2O Emissions Directly From Agricultural Fields

N input and N_2O Production in Tg N

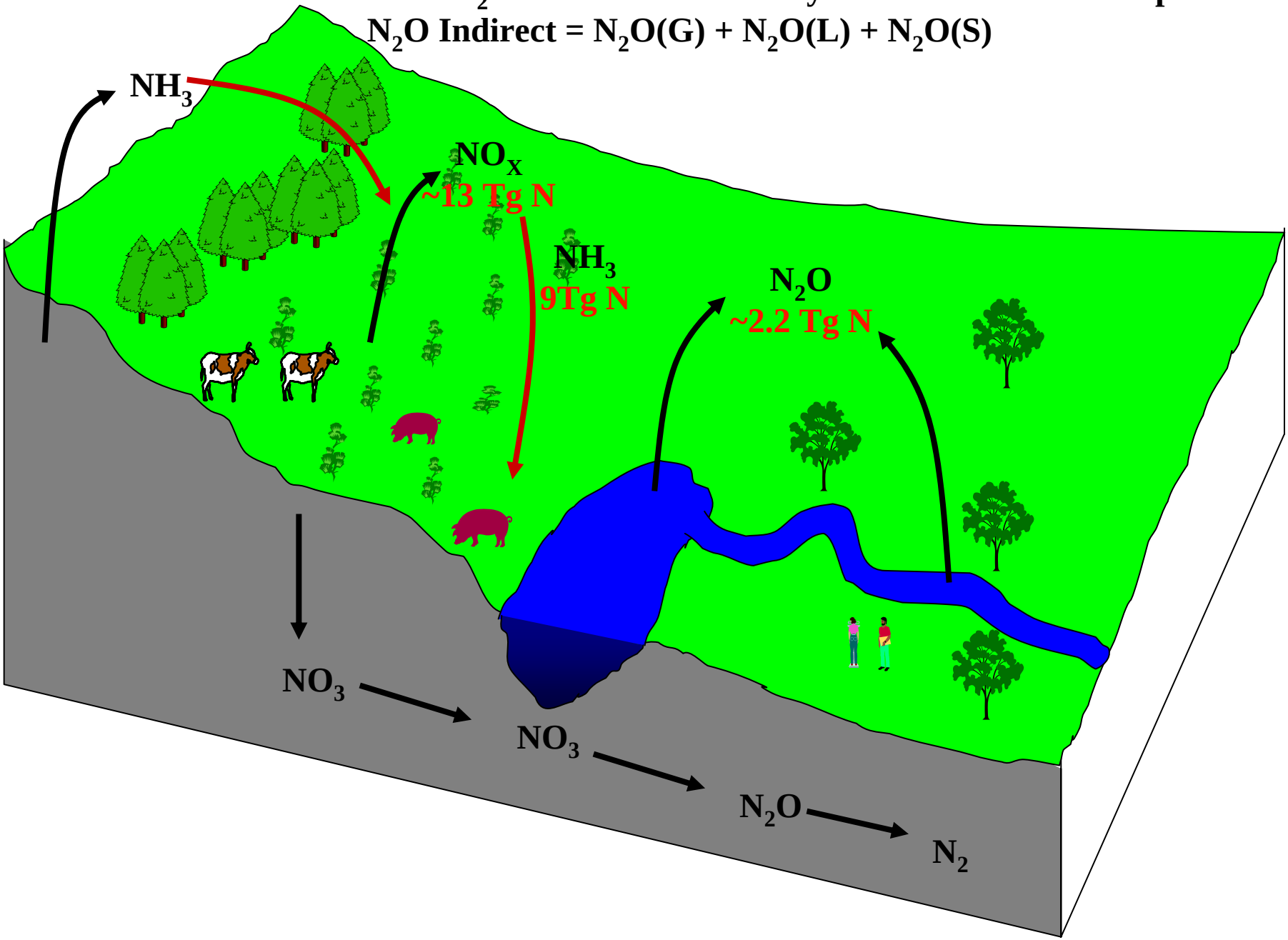


Estimates of Global N_2O Emissions From Animal Production

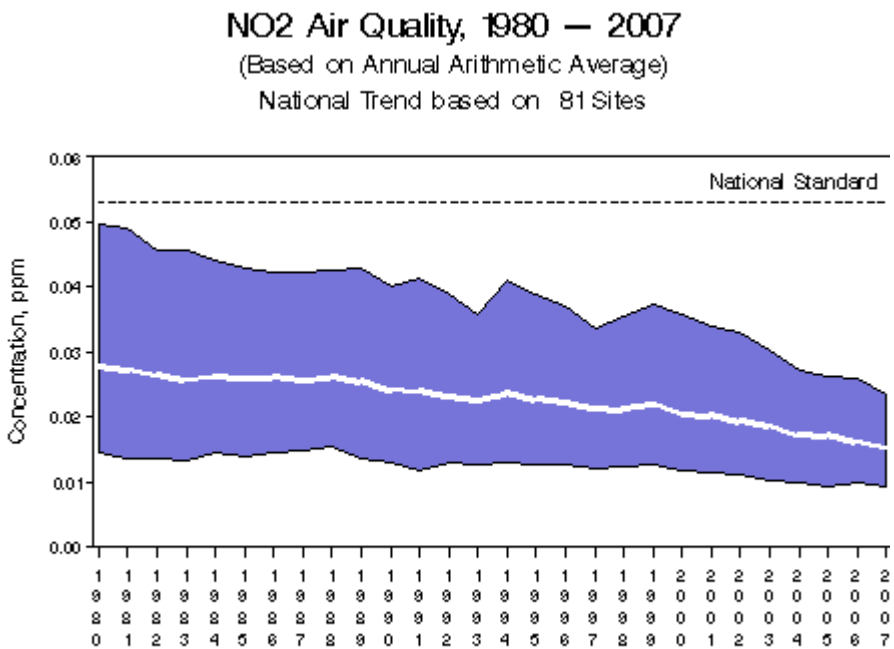


Estimate of Global N_2O Emissions Indirectly Derived from AGN Input

N_2O Indirect = $N_2O(G) + N_2O(L) + N_2O(S)$



AIR QUALITY TRENDS



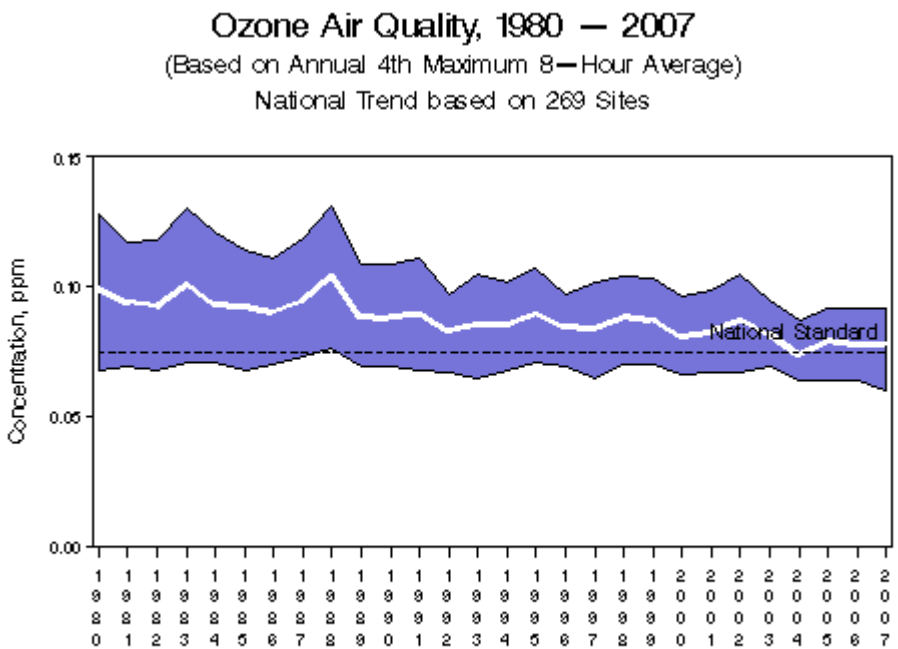
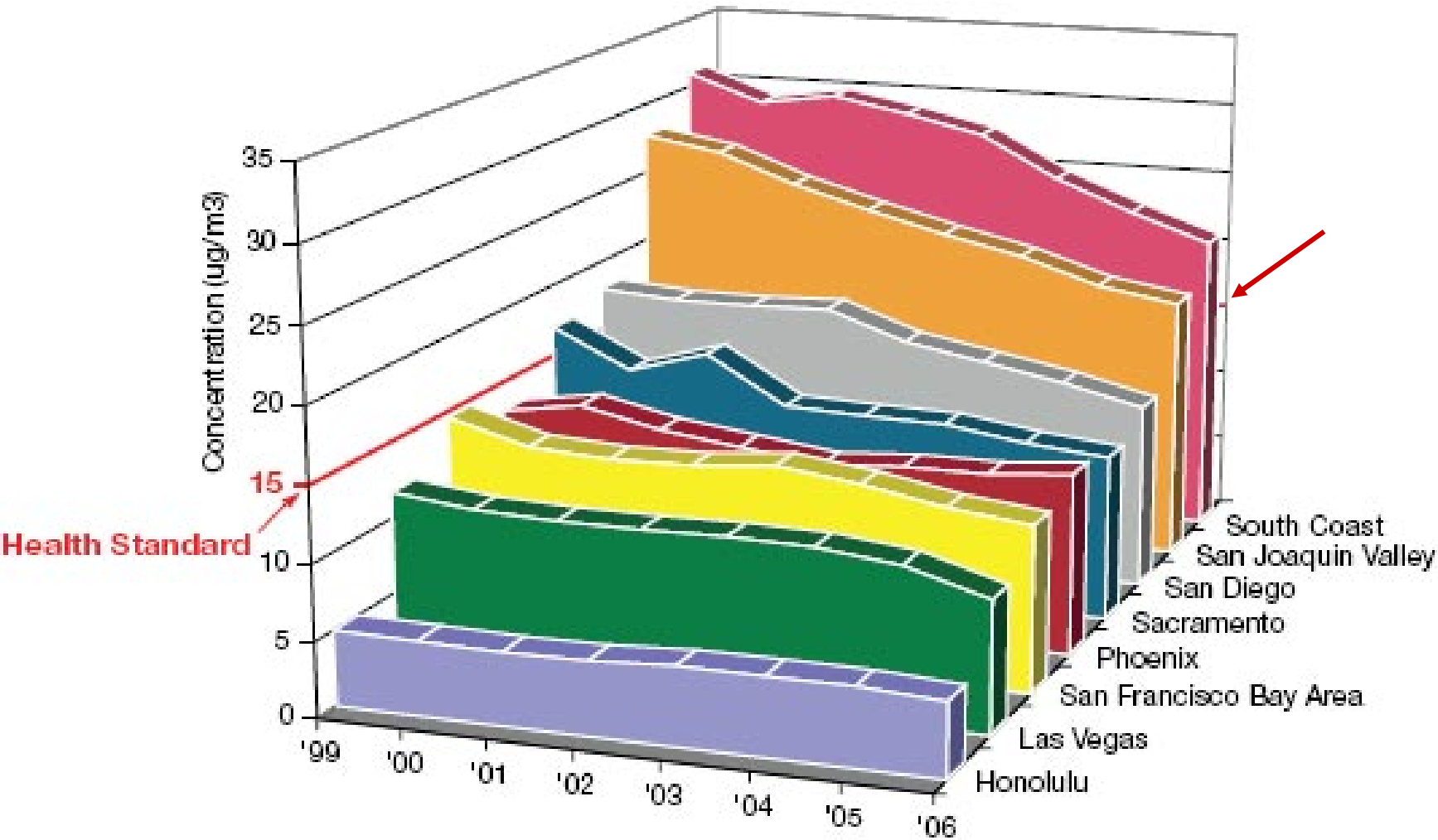


Fig. 2. Particulate Matter — $PM_{2.5}$ Concentrations

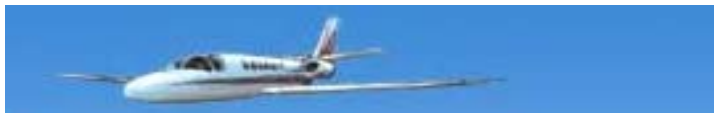
Mean Concentrations — Highest Site in Each Area



Source: US EPA's Air Quality System (AQS)

PREVENT AND CONTROL INVASIVE SPECIES

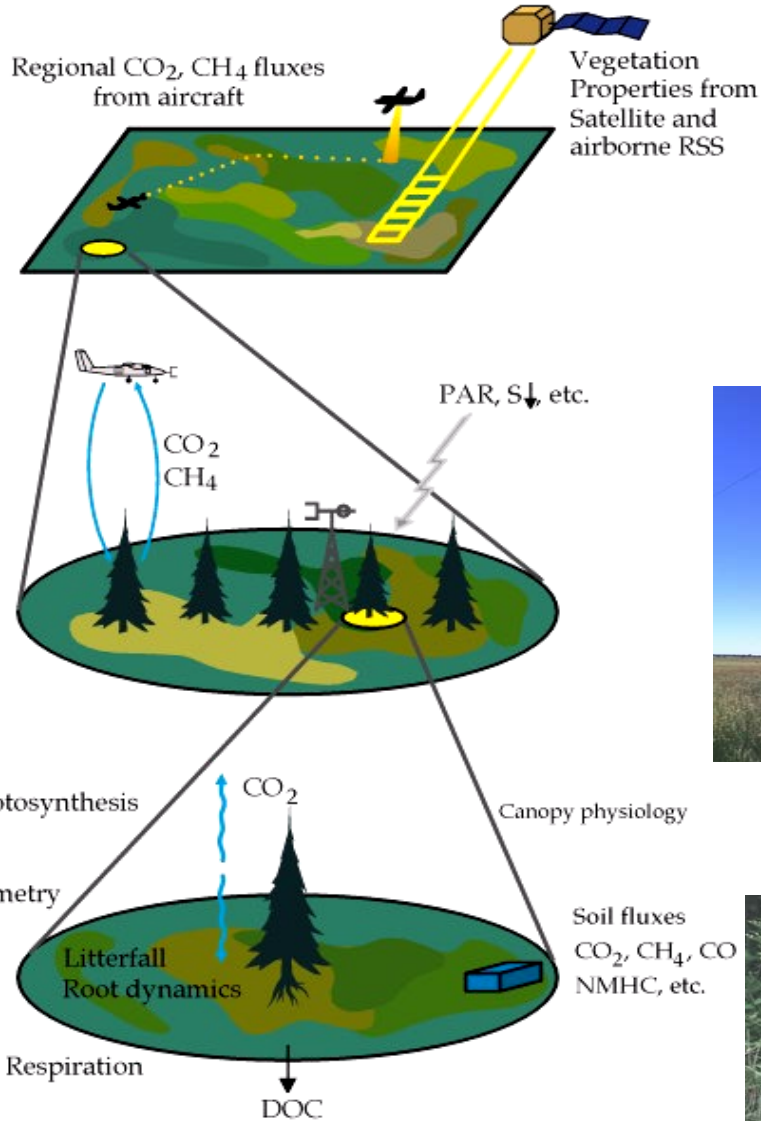
Multi-Scaled Observations for C & N accounting and GHG emission studies



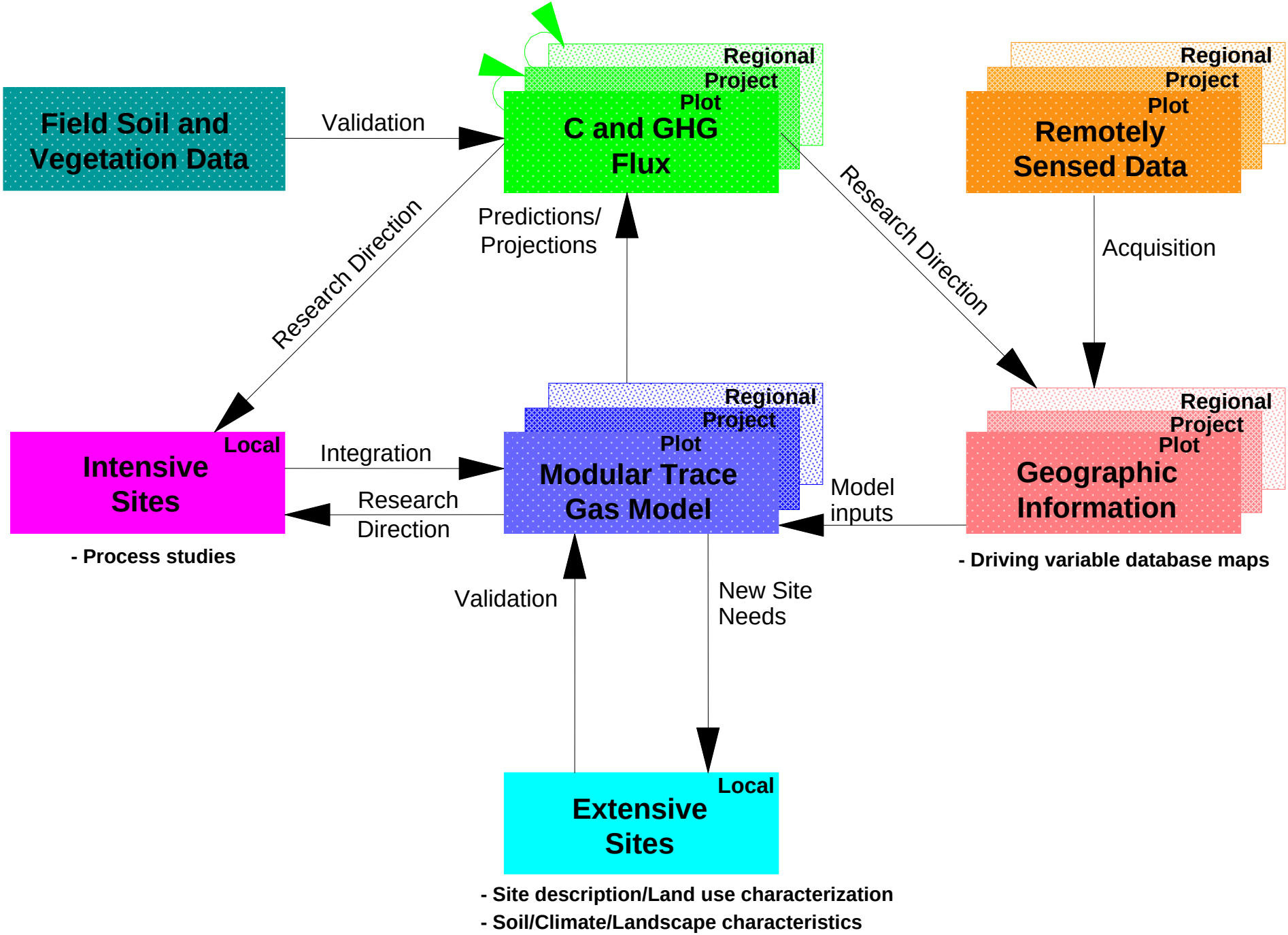
Regional Scale

Local Scale

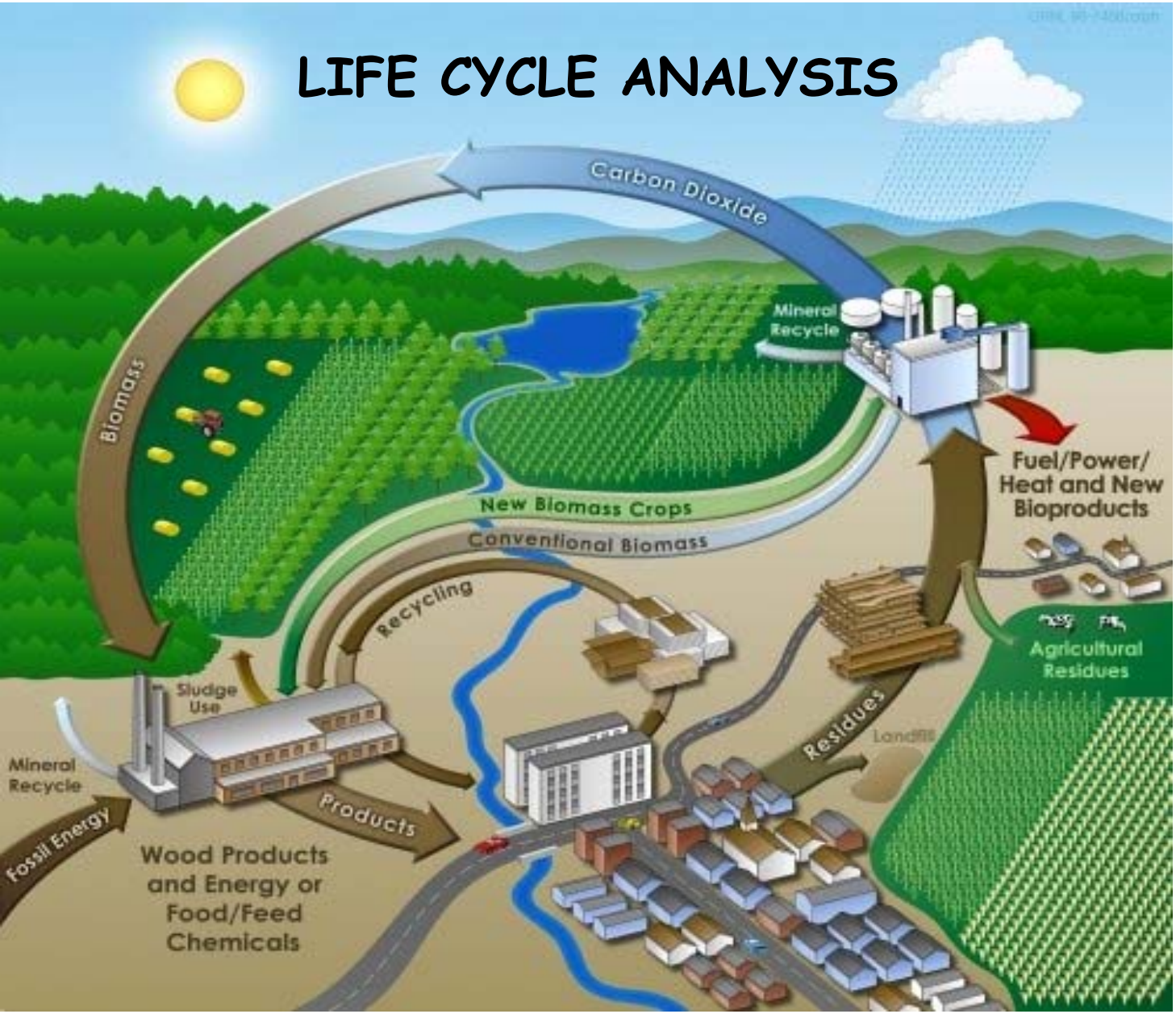
Plot Scale



GB44.013


Field Soil and Vegetation Data
Validation
Regional
Project
Plot
C and GHG Flux
Regional
Project
Plot
Remotely Sensed Data
Research Direction
Predictions/ Projections
Research Direction
Acquisition
Local
Intensive Sites
Integration
Research Direction
Regional
Project
Plot
Modular Trace Gas Model
Model inputs
Regional
Project
Plot
Geographic Information
- Process studies
- Driving variable database maps
Validation
New Site Needs
Local
Extensive Sites
- Site description/Land use characterization
- Soil/Climate/Landscape characteristics

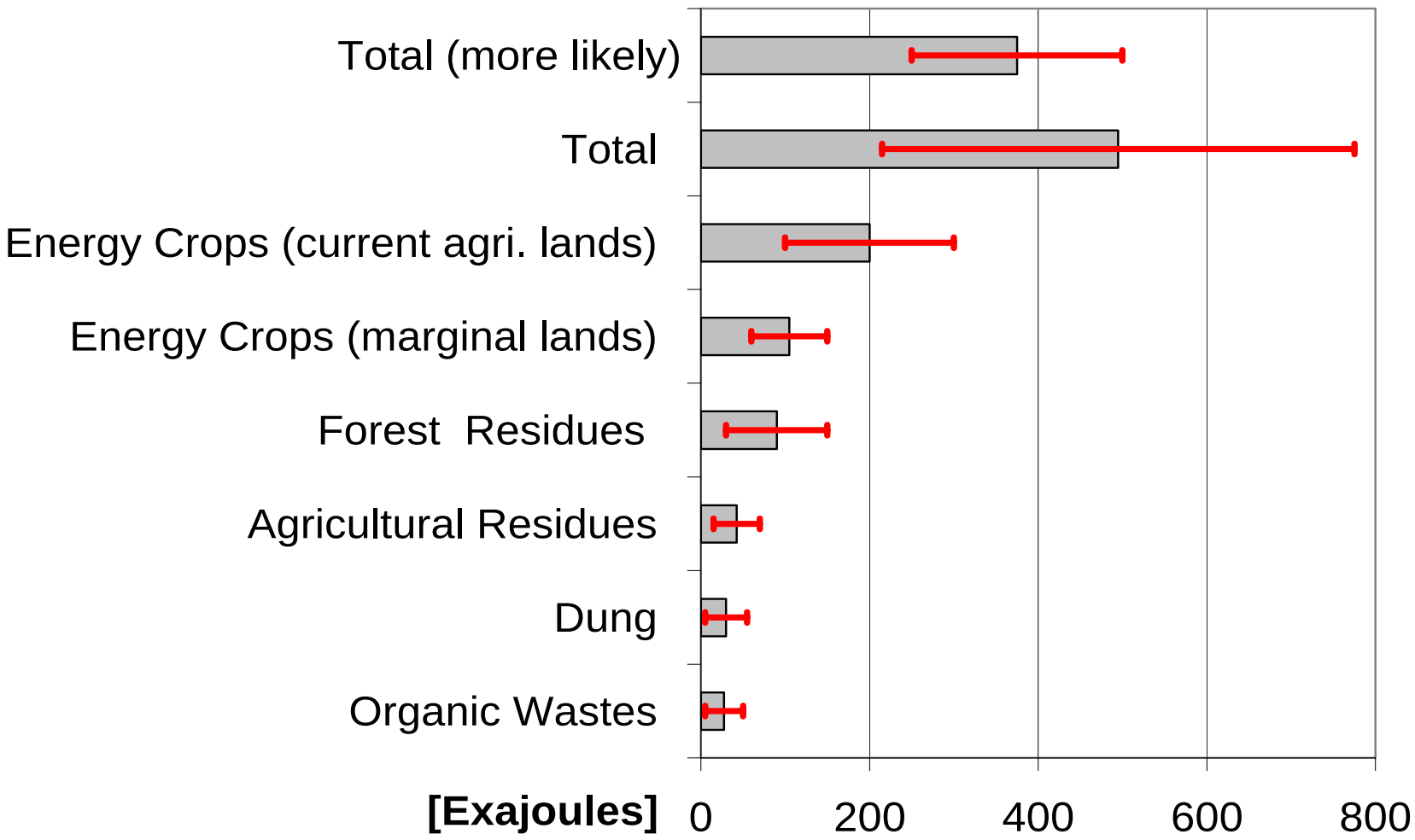
FUTURE CHALLENGE: BIOENERGY?



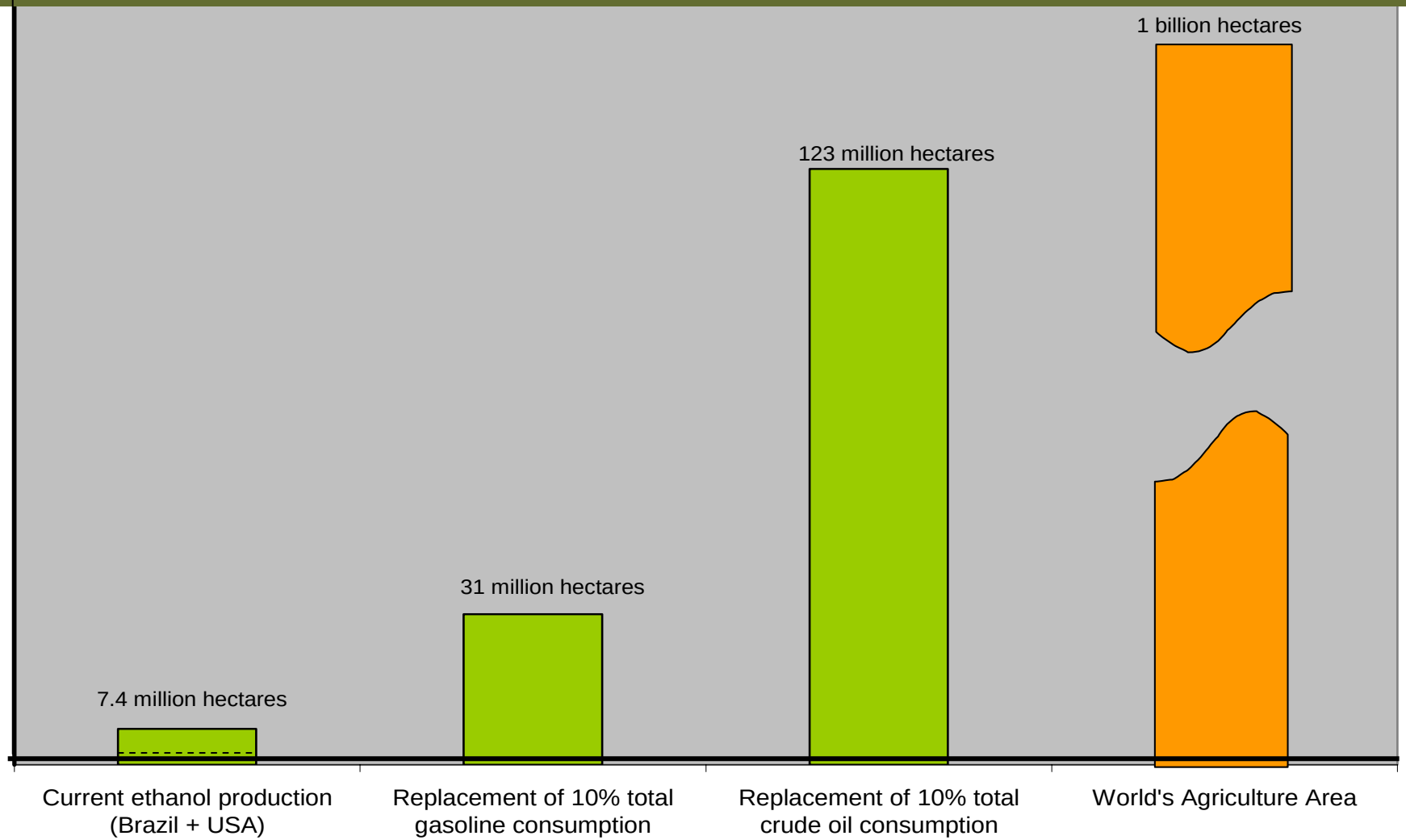
ENVIRONMENT:
Energy Balance
GHG
Land Use
Biodiversity
Water
Nutrients
Invasive Biota

SOCIAL:
Food vs Fuel
Aesthetics
Economic
Jobs/Training
Equity
Certification

Expected BioEnergy Production 2030 (FAO 2006)



Land Use to Ethanol



RESEARCH CHALLENGES

CLIMATE CHANGE

ENVIRONMENTAL

LAND USE CHANGE

CROSS-CUTTING ISSUES

FOOD SECURITY

ENERGY SECURITY

ECOSYSTEM SERVICES

POLICY

LIVELIHOODS

INTERSECTION OF THESE ISSUES PROVIDE A SET OF NEW RESEARCH OPPORTUNITIES

THE NP ASSESSMENT

- How has the ARS dealt with these challenges under current objectives?
- Has the research provided useful products?
- What are the needs for the future?

National Program 203
Air Quality

- Particulate Emissions (Medium)
- Ammonia and Ammonium Ammonia Emissions (Medium-High)
- Malodorous Compounds (High)
- Ozone Impacts (Medium)
- Pesticides and Other Synthetic Organic Chemicals (Low)

NATIONAL PROGRAM 204 – Global Change

- Carbon Cycle and Carbon Storage (Medium-High)
- Trace Gases (Medium-High)
- Agricultural Ecosystem Impacts (Medium-High)
- Changes in Weather and the Water Cycle at Farm, Ranch, and Regional Scales (Medium)

Assessment Findings

- Number of high quality publications
- Development and deployment of innovative research techniques and models
- Creation of partnerships among agencies, research institutions, and communities
- Implementation of finding among partner organizations

Assessment Findings

- Studies of multiple stress effects on agricultural systems
- Integrated studies of C-N-Water
- Better process understanding of air pollutants on crops
- Agricultural management practices to reduce the impact on air quality

Overall Recommendations

- Integrated research plan
- Greater integration and coordination of studies
- Hypothesis driven research
- Innovative research approaches to address multiple scales of challenges
- Networks and partnerships to leverage resources
- Synthesis efforts

SUMMARY

- Challenges and Opportunities for the ARS in coming decades
- Strategic planning of research needs to meet societal and scientific challenges
- Acknowledge and incorporate multi-dimensional issues in research planning and implementation