

Next Generation Ammonia Inventory for the San Joaquin Valley of California

Stephen M. Roe

E.H. Pechan & Associates, Inc.

Gerard E. Mansell

ENVIRON International Corporation

Presented by: **Frank Divita, E.H. Pechan & Associates**

Introduction



- Improved ammonia inventory for use in data analysis and grid-based aerosol modeling for the California Regional PM10/PM2.5 Air Quality Study (CRPAQS);
- 1-hour temporal resolution and 1-kilometer by 1-kilometer spatial resolution;
- emphasis is on important sources within the SJV.

Introduction



- Important anthropogenic sources in the SJV: livestock operations, fertilizer application, on-road vehicles, and biomass burning;
- Primary objectives of this study are to: incorporate information from new studies; improve spatial and temporal allocation of emissions; and develop an ammonia emissions model for use in developing updated inventories.

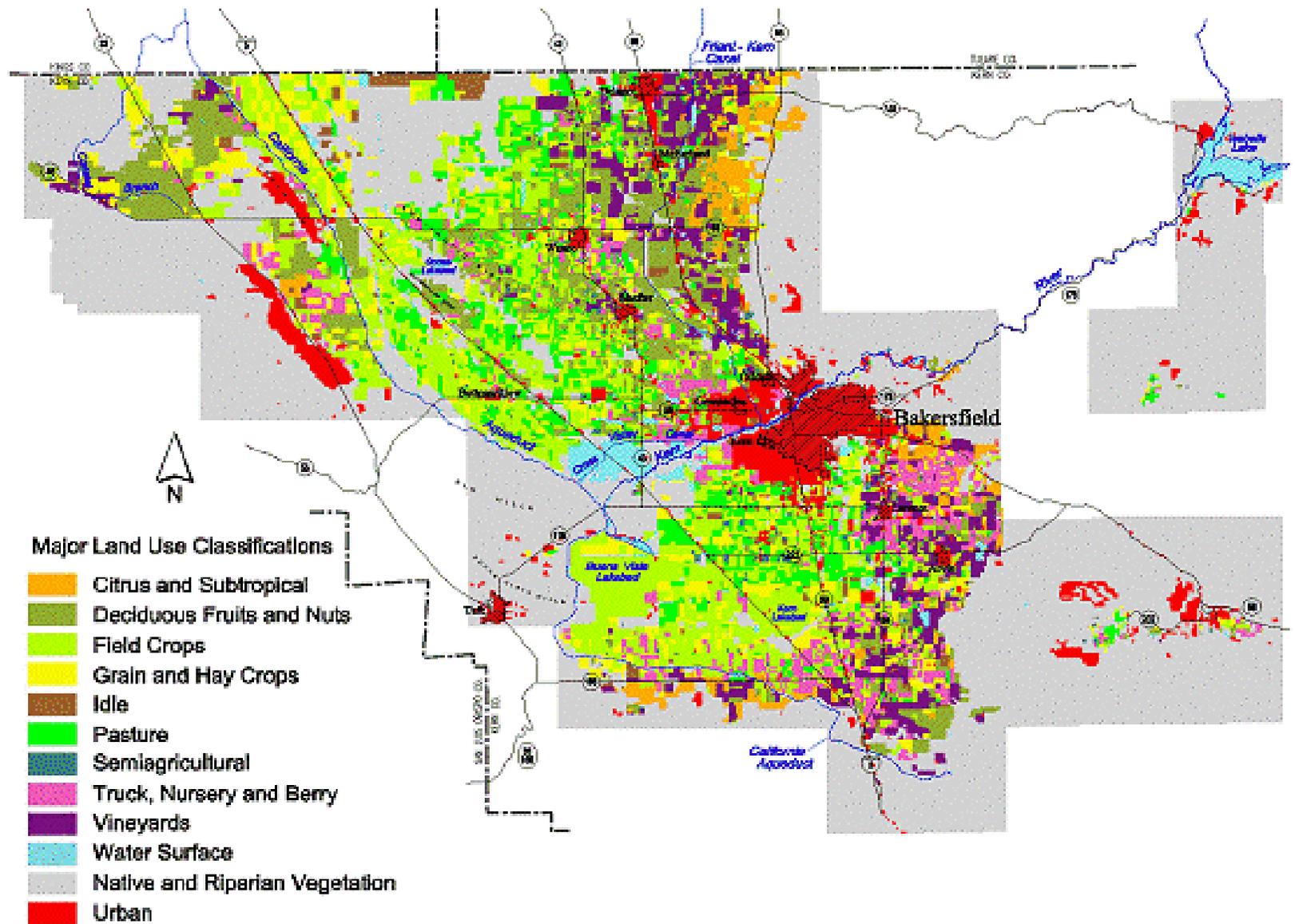
Methods

- Disaggregate emissions for better spatial and temporal allocation;
- Acquire/develop emission estimates and temporal allocation factors at the disaggregated level;
- Spatially allocate emissions to the best available land cover data.

Fertilizer Application

EIC Description ¹	EIC	CES
<i>Existing Code</i>		
Misc. Agricultural Losses	420-418-6000-0000	47050
<i>Proposed Codes</i>		
Fertilization Losses – Grain and Hay	420-418-6001-0001	47051
Fertilization Losses – Truck Crops	420-418-6001-0002	47052
Fertilization Losses – Citrus	420-418-6001-0003	47053
Fertilization Losses – Rice	420-418-6001-0004	47054
Fertilization Losses – Pasture	420-418-6001-0005	47055
Fertilization Losses – Vineyards	420-418-6001-0006	47056
Fertilization Losses – Deciduous Fruit and Nuts	420-418-6001-0007	47057
Fertilization Losses – Field Crops	420-418-6001-0008	47058

Kern Co. 1998 Land Use



Livestock Operations

EIC Description	EIC	CES
<i>Existing Code</i>		
Livestock Wastes	630-618-0262-0000	66605
<i>Proposed Codes</i>		
Cattle - Confined Dairy Operations	630-618-0262-0001	66606
Cattle - Confined Beef Operations	630-618-0262-0002	66607
Cattle - Grazing	630-618-0262-0003	66608
Cattle - Manure Spreading	630-618-0262-0004	66609
Poultry - Broiler Chickens	630-618-0264-0001	66612
Poultry - Layer and Pullet Chickens	630-618-0264-0002	66613
Poultry - Turkeys	630-618-0264-0003	66614
Hogs and Pigs	630-618-0266-0001	66618
Goats	630-618-0268-0001	66620
Rabbits	630-618-0270-0001	66622
Sheep and Lambs	630-618-0272-0001	66624
Mules, Burros and Donkeys	630-618-0274-0001	66626
Horses	630-618-0276-0001	66628

Cattle Emissions

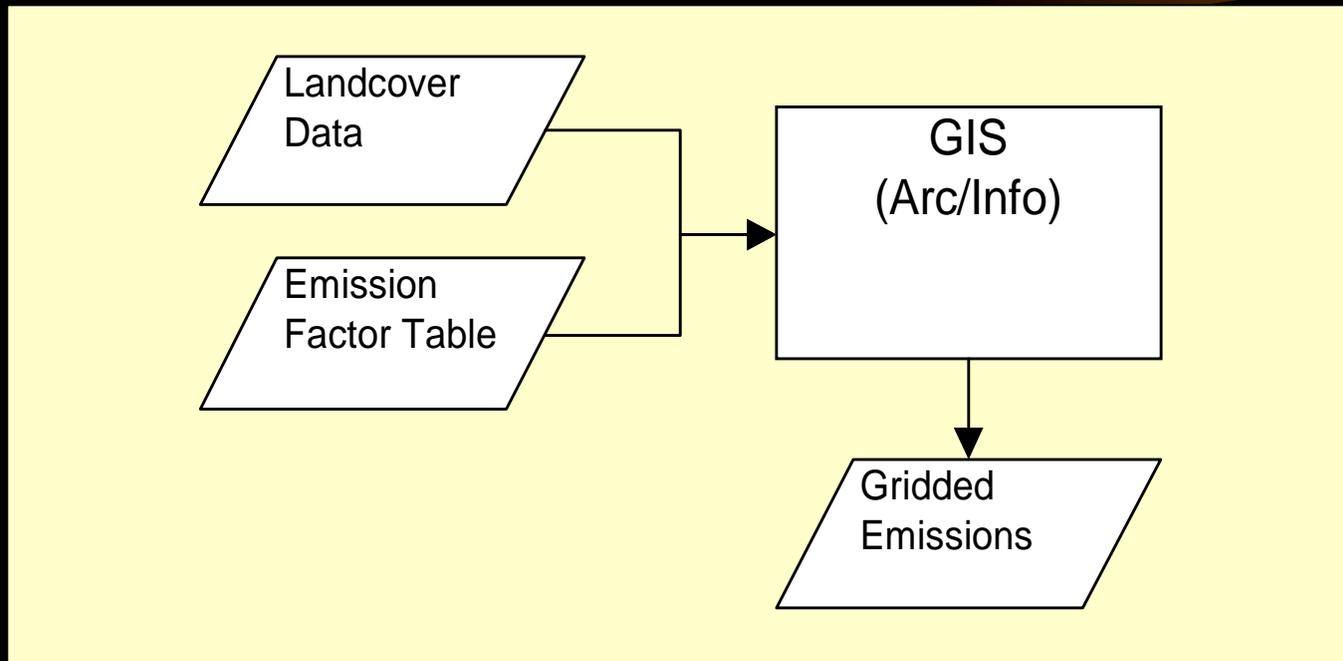
- **Spatial Allocation**
 - Geocode large dairies and beef feedlots as point sources;
 - Investigate spatial coverages for grazing operations;
 - Research SJV practices for manure spreading.
- **Temporal Allocation:** develop seasonal and diurnal allocation factors based on previously proposed empirical models.

Other Sources

- **Natural Soils** - incorporate recent CARB-sponsored soil gas modeling results;
- **On-Road Vehicles** - develop emissions based on previously-gridded VMT and a fleet-wide emission factor from recent tunnel studies in CA;
- **Biomass Burning** - (e.g., residential wood) - use emission ratios of NH₃ to CO based on wildfire studies and the existing CO inventory.

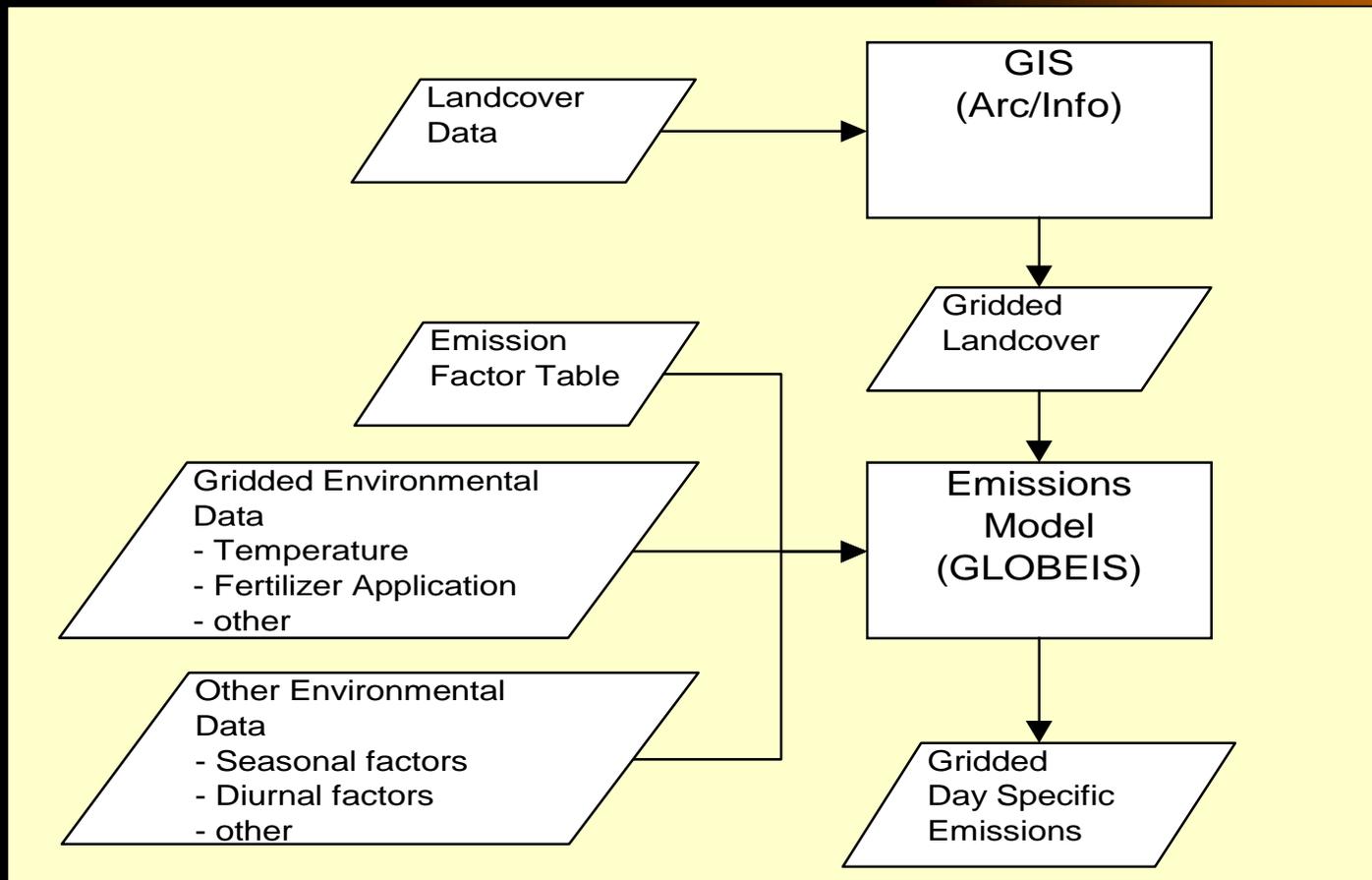
Ammonia Emissions Model

(Simple approach to estimating ammonia emissions within the GIS)



Ammonia Emissions Model

(Estimating emissions using a model to account for environmental effects)



Ammonia Emissions Model

(Main GLOBEIS Interface)

The screenshot displays the GLOBEIS software interface. At the top center, the word "GLOBEIS" is written in a large, white, serif font within a white-bordered box. Below this, a smaller white-bordered box contains the text "Select Modules to Execute". Underneath, there are two columns of checkboxes, each followed by a blue-bordered box containing the module name. The first column includes: "1 Import Domain Definition", "2 Import Land Use", "3 Import Cloud Cover", "4 Import Temperature", and "5 QA Inputs". The second column includes: "6 Calculate Emissions", "7 Calculate CB4 Emissions", "8 Export Emissions", and "9 Cleanup". At the bottom right, there are two grey buttons: "Run Modules" and "Quit". In the bottom left corner, the text "Type Alt-F1 to view database" is displayed. In the bottom right corner, the text "Globeis version 2.0" is displayed.

GLOBEIS

Select Modules to Execute

- 1 Import Domain Definition
- 2 Import Land Use
- 3 Import Cloud Cover
- 4 Import Temperature
- 5 QA Inputs
- 6 Calculate Emissions
- 7 Calculate CB4 Emissions
- 8 Export Emissions
- 9 Cleanup

Run Modules Quit

Type Alt-F1 to view database Globeis version 2.0

Ammonia Emissions Model

Enhancements to GLOBEIS for CRPAQS Study:

- Switch to turn off biogenic emissions calculations for ammonia applications;
- Add ability to specify seasonal and temporal profiles by source category;
- Add environmental relationships between ammonia emission factor and environmental factors (temperature, RH, soil pH, soil moisture, etc);

Ammonia Emissions Model

Enhancements to GLOBEIS for CRPAQS Study:

- Add ability to treat point source emissions data;
- Update look-up tables for source-specific and land use-specific emission factors.