Assuring Quality of Planning Models
EC 1105-2-412 Rollout

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Deputy, Planning Community of Practice, HQUSACE

June 14, 2011

Ground Rules

- Please MUTE your phones.
- Please hold questions for the end
- Type all participants names in to the chat feature, so we can get a count.
- Questions and comments will be facilitated at the end of the webinar.
Assuring Quality of Planning Models

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14 June 2011

Bruce Carlson
Senior Policy Advisor, HQ

What’s It About?

- Credibility, transparency – show our work!
- What are the relationships in the model?
- How have we confirmed the computations are correct?
- How understandable is the model to users and reviewers?
- Documentation so people can quickly understand what has been done and why.
Guidance and Process

- “Assuring Quality of Planning Models” – EC 1105-2-412
- Processing is done by the PCX’s
- Decision to certify / approve made by HQ panel
- Certification and approval both require thorough testing and documentation

Don’t End Up Like This!
(Independent External Peer Review Comment – 2011)

- **Comment 4:**
  - The XYZ model by itself has very limited value for analyzing alternatives and is not a substitute for conventional economic and engineering analysis.

- **Significance – High:**
  - The XYZ model functions as a black box and does not allow an alternatives analysis that is clearly based on sound technical evidence of engineering design performance.
Basic questions for Model Review Process to address:

- Theory
- System Testing
- Usability
- Future Developments
- Additional Considerations

Theory

- Are main relationships and assumptions transparent, and reflective of the state of the art
- Are model boundaries clear? Which relationships are fixed in the model, which are user defined inputs
- Are any relationships to policy clear, along with implications for compliant applications
- Is risk and uncertainty addressed in the model? If not, is it clear how to perform R & U analysis using the model
System Testing

- Is the level of testing appropriate for the complexity and makeup of the model?
- Has the model been tested with real data?
- Has the model been “battlefield tested” with intentionally irrational data to confirm how model processes?
- Does the model employ math and logic checks to reduce errors from bad data?
- Is the model code (or spreadsheet cells) protected, so it cannot be easily overwritten or intentionally modified?

Usability

- To what extent is the user’s manual instructive and comprehensive?
- Is training available?
- Can field practitioners be expected to be able to use the model, or does it require a development team “guru” to run the model?
- Is there a reviewer’s guide of tips to consider when reviewing applications of the model?
- Does the model offer useful display capabilities?
Future Developments

- Are there recommendations for future development to keep the model current with the state of the art, and with needs of specific applications?

Additional Considerations

- Is there an unambiguous identifier (such as model Version #) so it is clear which model version is certified – necessary for both users and reviewers.
- Are there regional restrictions or other restrictions, and are these clearly identified in the documentation.
- How long until the model should be revisited?
Corporate Models Certified

- IWR-Planning Suite (version 1.0.11.0) Certified September 2008
- HEC FDA Certified March 2009
- Beach FX - Certified April 2009
- Harbor-Sym (widening) – Certification pending May 2011

Certified Economics Tools (Field Generated)

- Package of Commonly Used Economic Tools, certified May 2010
- √ Average Annual and IDC
- √ Compound Growth Rate
- √ Unit Day Value
- √ Interest and Annuity Table
- √ IWR Plan Annualizer
Assuring Quality of Planning Models

Planning Model Review

Jodi Staebell
Ecosystem Restoration
Planning Center of Expertise

Objectives

- Provide an overview of the Model Review process
- Highlight key information related to model review and the model review process
- Provide some lessons-learned
Model Review

- Process to review, improve, validate analytical tools and models
- Toolbox - Ensure high quality methods and tools available to enable informed decisions
- Technical quality
  - Theory
  - Computational correctness
- System Quality
- Usability

Model Review References

- Information Quality Act (PL106-544)
- OMB Information Quality Bulletin for Peer Review
- Report of the Planning Models Improvement Task Force
  - Engineer Circular 1105-2-412 (New!)
  - HQ Memo Policy Guidance on Certification of Ecosystem Output Models, Aug 08
  - Ecosystem Restoration Model Library
Model Review Basics

- Definition - any model or analytical tool used to
  - Define problems and opportunities
  - Formulate alternatives
  - Evaluate effects
  - Support decision-making

- Planning models, not engineering models
- Review is cost-shared
- In-house or contracted

Model Basics

Stages of Model Development
- Requirements stage
- Development stage
- External Testing
- Implementation

Model categories
- Corporate
- Regional/local
- Commercial off-the-shelf
- Models developed by others
Certification vs. Approval for Use (Jodi’s working definition)

- Certification (Corps Models)/Approval (Non-Corps Models)
  - Regional Models
  - Models to be used on multiple projects
  - Increased rigor of review for Certified/Approved Models
- Approval for Single Use
  - Single-use models
  - Review can be conducted as part of technical review for a specific project
  - Increased rigor of review for single-use models used on large, controversial projects

Model Documentation

- Provided by model proponent/Home PDT
- Outline in EC 412 Appendix A, Table 2
- Documentation includes
  - Background
  - Theory, assumptions, analytical requirements, formulas
  - Software/hardware, testing/validation process,
  - Availability of input data, usefulness to support project analysis, tech support, training
- Software/spreadsheets should also be provided for review
Model Certification Review Plan

- Requirement in EC 412
- “Each certification action will require a certification review plan – akin to PMP”
- Suggested outline in Attachment 2 of EC 412
- Sample Certification Review Plans to be posted on ER Gateway, Tools

Model Certification Review Plan

- PCX charged with development of Certification Review Plan
- ECO-PCX encourages PDT to develop first draft
- Must be coordinated with HQ
  - Thru appropriate RIT, log in with OWPR
  - Corporate models through PCoP, log in with OWPR
Suggested Certification Review Plan Outline

1. Purpose
2. References and Guidance
3. Background
4. Documentation to be provided by Model Proponent
5. Type/Scope of Review
6. Description of Tasks
7. Certification Review Team Composition
8. Schedule of Deliverables
9. Cost Estimate

Checkpoint Meeting

- Discuss comments with model review team
- Invite Office of Water Project Review Subject Matter Expert (OWPR SME)
- PCX
- Model Proponent
- PDT

Key Milestone!
Model Certification HQ Panel

- Harry Kitch, Chair
- Sue Hughes
- Wes Coleman
- Lee Ware
- OWPR Economics (vacant)
- Mark Matusiak
- Bruce Carlson
- Dave Moser
- Lillian Almodovar, IWR
- Robert Bank, HQ Civil Works Engineering

- OWPR will assign a Subject Matter Expert to assess model recommendation

Scheduling and Timing

Schedule

- Start SOW to Notice to Proceed – 8-12 weeks
- NTP to Final Model Review Report – 15-18 weeks
- Revise model – depends on PDT
- PCX recommendation to HQ – 4 weeks
- HQ review and certify - ?

Timing

- Requirements and/or development stage
- Identify models at (prior to) Feasibility Scoping Meeting
- Initiate model review prior to Alternative Formulations Briefing
Model Certification Cost Range

In-house Review
- By subset of ATR team
- 3 reviewers extra time to review model
- $30-50k

External Review
- Contract - $80-150k/model
- PCX labor ~$10-15k
- Model proponent labor
  - Prepare model documentation
  - Assist in Model Cert contract
  - Revise model and documentation

How can the model proponent help?
- Identify models early (Review Plan or not later than FSM)
- Prepare model documentation
- Test/validate model
- Check software
- Identify expertise needed
- Be open to process
- Pool funds for multiple-use models
ECO-PCX Model Certification Experience

- See certified/approved models on Ecosystem Restoration Gateway Model Library

- See Model Certification Status on ECO-PCX website

- See Model Review Sample Charge Questions on ECO-PCX website

### ECO-PCX Model Certification Experience

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Model Certification Resources

- HQ Website, Models
  - [http://www.usace.army.mil/CECW/PlanningCOP/Pages/models.aspx](http://www.usace.army.mil/CECW/PlanningCOP/Pages/models.aspx)
  - EC 1105-2-412
- ER Gateway, Tools
  - List of approved HSI Models, links to other models
- ER Gateway, Learning
  - Webinar on Model Certification (5/5/09)
- IWR is assisting with review of Ecosystem Planning Models – Shawn Komlos

Improvements

- Development of Model Review Standard Operating Procedures in FY11
- HQ developed process for processing Model Review Recommendations
- Regular meetings of HQ Model Certification Panel
- ER Gateway Model Library
- Reaching out to virtual resources – Districts, ERDC, IWR, Universities, Industry
Ecosystem planning models

LESSONS LEARNED

Quality Models

- Describe model assumptions and theoretical basis
- Aggregation formulas
  - Type – arithmetic mean, geometric mean, additive, limiting factors
  - Provide supporting information
- Testing, Verification and Validation
- Version control
- Assumptions/supporting literature for relationship between physical parameters and quality
Quality Models

- Identify applicable geographic range
- Development/documentation of more precise approach to data collection
- Performance measures
- Ability to handle risk and uncertainty analyses, sea level rise scenarios and climate change scenarios

Spreadsheets

- Highlight input and output cells
- Lock editing on other cells
- Validation of input data
- Error checks
- Clear version number
- Spreadsheet tab with user information
- Calculation of annualized benefits (divide by # years in period of analysis)
Application

Document application assumptions

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Wesley Coleman
Chief, Office of Water Project Review, HQUSACE
Model Quality Assurance FAQ’s

- Watershed studies? (yes)
- Grandfathering? (no)
- Mitigation models? (yes)
- Models developed by others?
- What does “policy check” entail?

FAQ’s (cont.)

- What are typical time and cost estimates?
- When is the right time to start the process?
- Won’t this requirement stifle innovation?
- Are standards lower for “approved” models than for “certified” models?
- Shouldn’t models that have been in peer reviewed publications be automatic?