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MINISTRY OF WATER AND ENERGY
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CGIAR INITIATIVE ON NEXUS Gains

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE
IFPRI

Groundwater governance policy tools and opportunities in Ethiopia

Wednesday December 18, 2024
3:00-5:00pm Addis Ababa, East Africa Time
7:00-9:00am Washington DC, EST

Welcome to the workshop!

- Please introduce yourself in the Chat
  - Name, place, title, affiliation
- Please post questions in the Q&A
- Please mute unless invited to speak
- Please turn video off unless speaking
- Workshop will be recorded. Links to slides and recorded video will be made available to participants

Agenda

3:00pm	**Opening remarks** – Moderator: Ambassador Seleshi Bekele Dr. Zebene, Advisor to Minister, MoWE Dr. Claudia Ringler, Director, Natural Resources and Resilience, IFPRI
3:15pm	**Governing groundwater with knowledge, motivation, and agency** Dr. Ruth Meinzen-Dick, Senior Research Fellow, IFPRI
3:25pm	**Groundwater games in Ethiopia: Lessons from the field** Dr. Fekadu Gelaw, Haramaya University and Hagar ElDidi, IFPRI
3:35pm	**Policy toolkits and strategies for groundwater nexus governance in Ethiopia** – Dr. Bryan Bruns
3:45pm	**Panel** Dr. Taye Alemayehu, Advisor to Minister, MoWE Dr. Tenalem Ayenew, Addis Ababa University Dr. Seifu Kebede, University of KwaZulu Natal / Addis Ababa University Q&A
4:10pm	**Breakout and plenary: Discussion of priorities and next steps** Workshop participants
4:50pm	**Closing Remarks** Dr Kebede Gerba, Advisor of the Ministry Dr. Ruth Meinzen-Dick, IFPRI

Considering tools and strategies for groundwater nexus governance in Ethiopia

Bryan Bruns, bryanbruns@bryanbruns.com

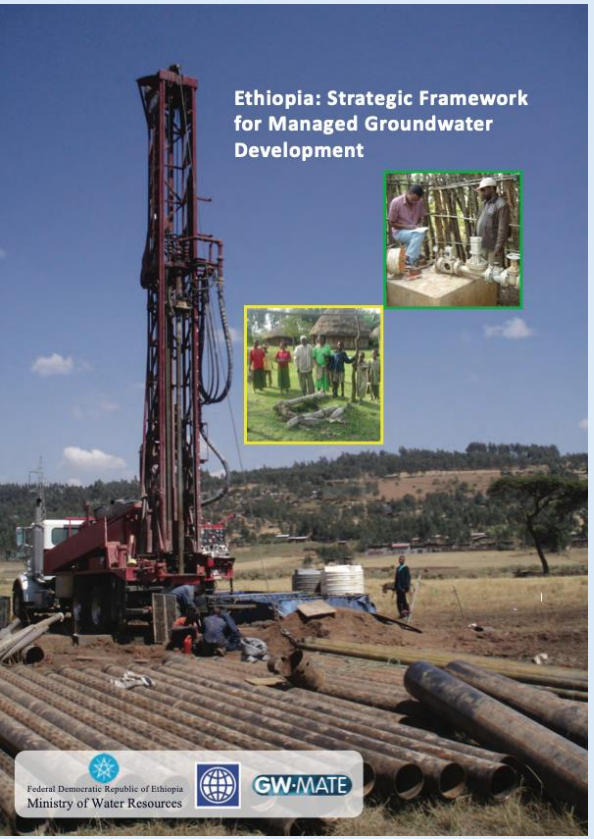
December 18, 2024

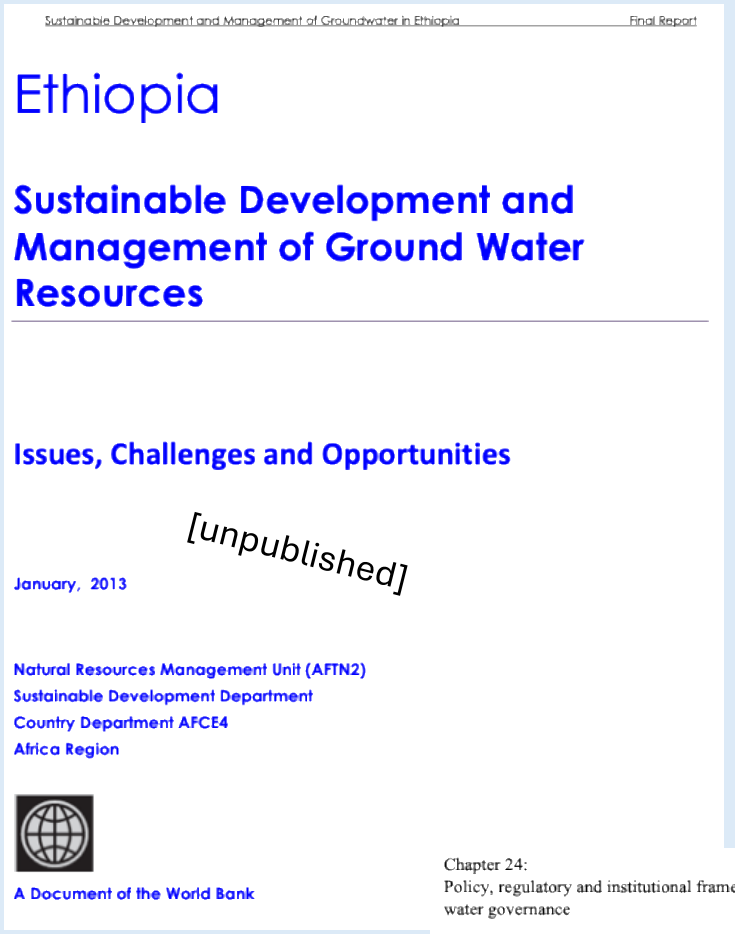
Overview

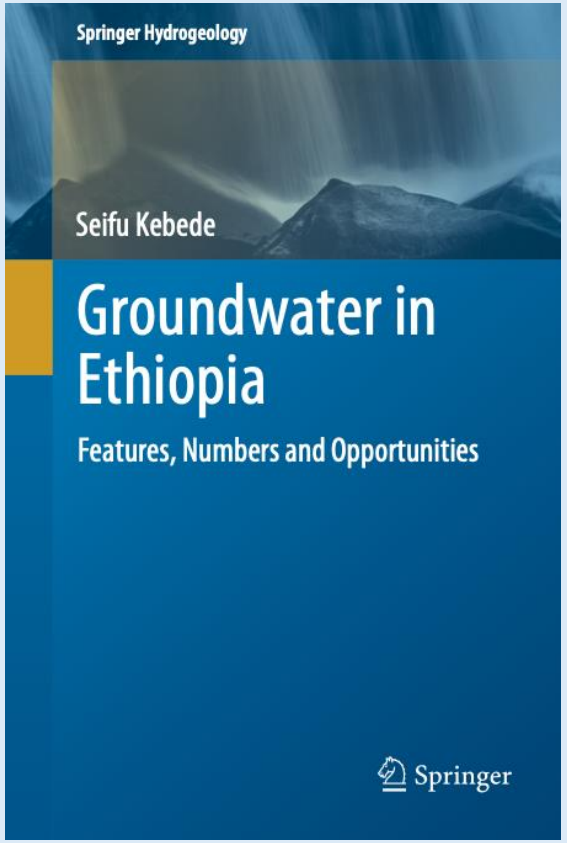
- Nexus Gains for Water-Energy-Food-Ecosystems
- An assessment of key elements that can support Ethiopian groundwater governance - based on a global review of groundwater policies
- KMA: Actor knowledge, motivation, and agency framework
- Policy tools for groundwater governance
- Toolkits – combining tools to fit contexts
- Three opportunities for nexus governance
  - Shallow groundwater for multiple use
  - Enhancing groundwater recharge
  - Groundwater-surface water linkages
- Water tenure and allocation
- Polycentric governance for multi-level federal systems, basins, and problemsheds
- Forthcoming IFPRI Discussion Paper

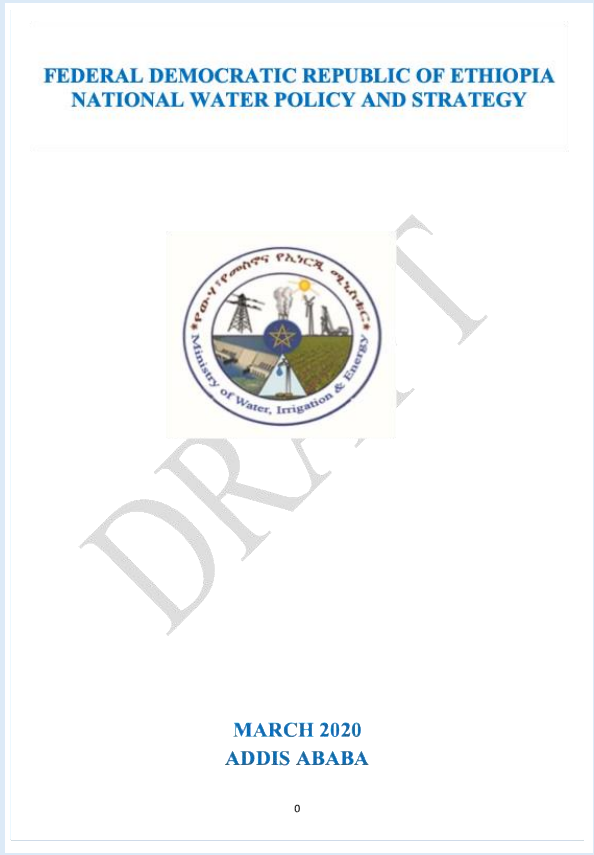
Women's group playing the groundwater game in Ethiopia, March 2021
Photo credit: Fekadu Gelaw

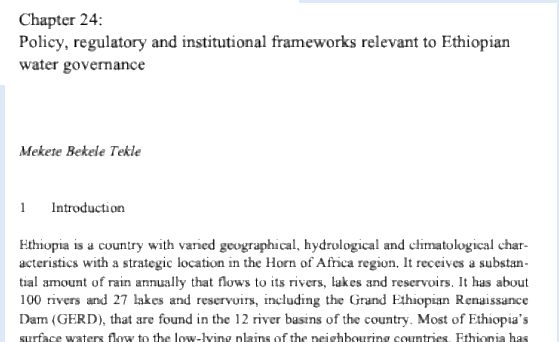
Desk review of available documents - examples

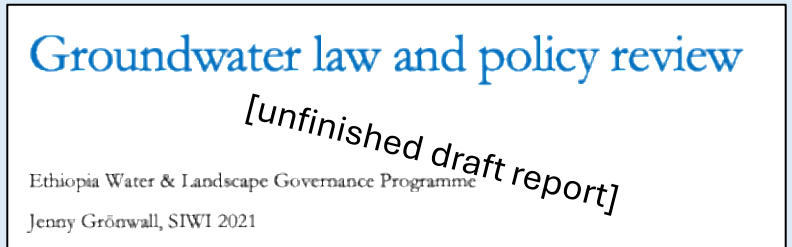








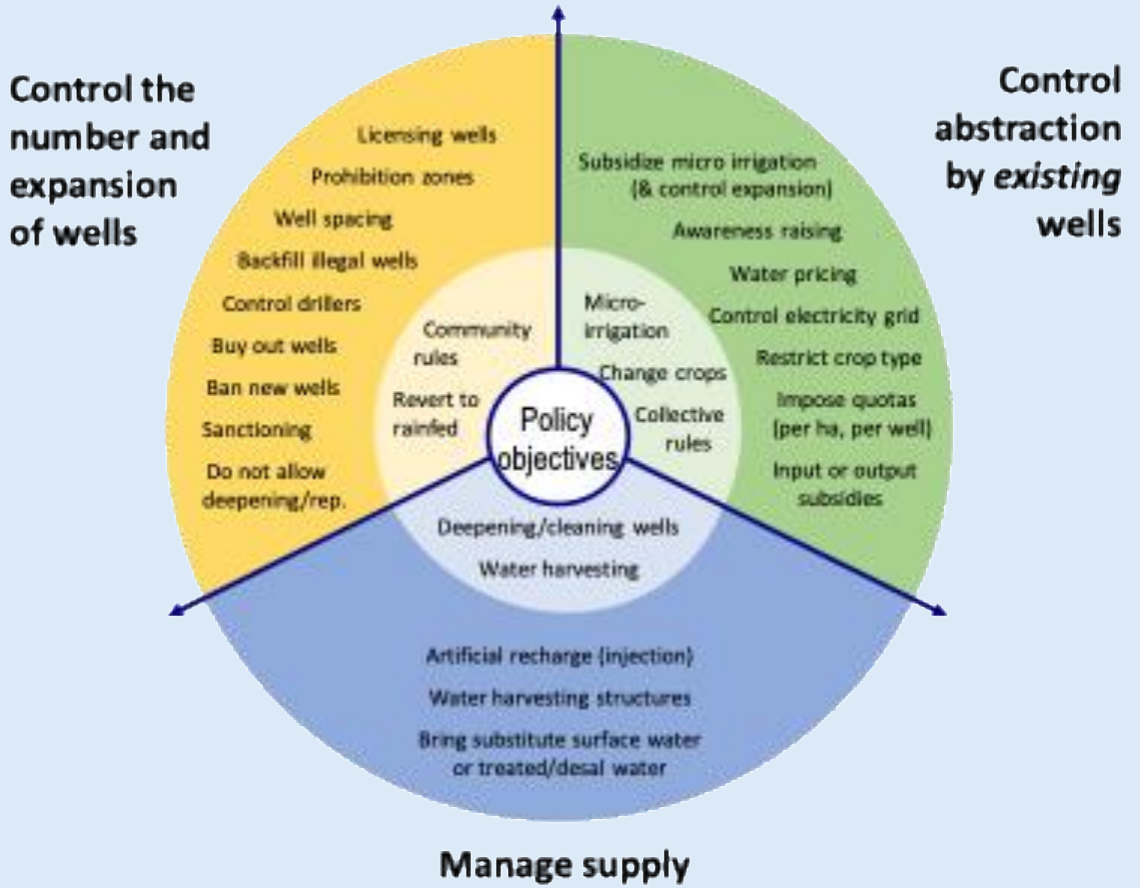




International experience with tools for groundwater governance

- Groundwater is hard to govern: an invisible, mobile resource with many dispersed users
- Lots of tools, but they often don't work
- IWMI research shows conventional state-led approaches to using tools for controlling groundwater over-exploitation, such as permits, metering, and volumetric limits usually don't work as expected.
- As generic standardized tools, not "fit for purpose", need to be customized and combined to match contexts

Figure 1. Main groundwater policy objectives and tools (Molle and Closas, 2017).



Meinzen-Dick, Ruth, and Bryan Bruns. 2024. "**Crafting Combinations to Govern Groundwater: Knowledge, Motivation, and Agency**." *International Journal of the Commons* 18 (1). https://doi.org/10.5334/ijc.1473.

Image source: Molle, Francois, Elena López-Gunn, and Frank Van Steenbergen. 2018. "**The Local and National Politics of Groundwater Overexploitation**." *Water Alternatives* 11 (3). https://www.water-alternatives.org/index.php/alldoc/articles/vol11/v11issue3/448-a11-3-1/file.

Toolkits: Combinations of tools

- Different sets of tools for different conditions
- Examples of toolkits
- Experiential games can shift information and knowledge (mental models)
- Strong motivations can come from identity, morality, and social norms, as well as caring for family, community, and environment
- Coordinating crop choices can be an effective means for agency, as can changing access to energy, and building trust and other social institutions for cooperation

a. Typical customary rules	b. Conventional regulation	c. Western India
• Well spacing • Protection zone • Seasonal restrictions on water use	• Well licensing • Mandatory meters and reporting • Volumetric quotas	• Watershed conservation and groundwater recharge • Restricted access and separate supply for electricity • Pilots for selling solar to grid
d. Andhra Pradesh Farmer Managed Groundwater Systems (APFAMS), India	**e. Foundation for Ecological Security (FES), India**	**f. Synthesis for North China Plain**
• Participatory monitoring of rainfall and well water levels, mapping recharge • Crop-water budgeting • Voluntary coordination of crop selection	• Groundwater game with debriefing • Information system on soil and water • Crop-water budgeting • Groundwater recharge • Community rules	• Irrigation quotas • Monitoring by electricity meters • Compensation for fallowing • Replace groundwater with imported surface water

Meinzen-Dick, Ruth, and Bryan Bruns. 2024. "**Crafting Combinations to Govern Groundwater: Knowledge, Motivation, and Agency**." *International Journal of the Commons* 18 (1). https://doi.org/10.5334/ijc.1473.
Also see: Sanil, Richu, Thomas Falk, Ruth Meinzen-Dick, and Pratiti Priyadarshini. 2024. "**Combining Approaches for Systemic Behaviour Change in Groundwater Governance**." International Journal of the Commons 18 (1): 411–24. https://doi.org/10.5334/ijc.1317.

Water-Energy-Food-Ecosystems Nexus governance

- The previous Nexus Gains research on groundwater governance, drawing heavily on experience in South Asia, had identified three priorities for nexus governance:
  - Sustaining solar pumping
  - Sharing recharge
  - Including ecosystems
- Ethiopia has different and diverse conditions for society and hydrogeology. Need to adapt tools and combinations of tools and priorities to fit conditions in Ethiopia
- Considering Water-Energy-Food-Ecosystems linkages and conditions in the context of Ethiopia, suggests reframing more broadly as three priorities for nexus governance:
  1. Shallow groundwater for multiple use
  2. Enhancing recharge and sharing storage
  3. Governing groundwater linkages with surface water

As an example of the need to consider context: like India, Ethiopia has crystalline basement rock, which may have shallow regolith aquifers. However, Ethiopia also has large shield volcanoes; areas of uplift, erosion, and sedimentation; and the rift valley with ancient lakebeds and modern lakes, so different and diverse hydrogeology.

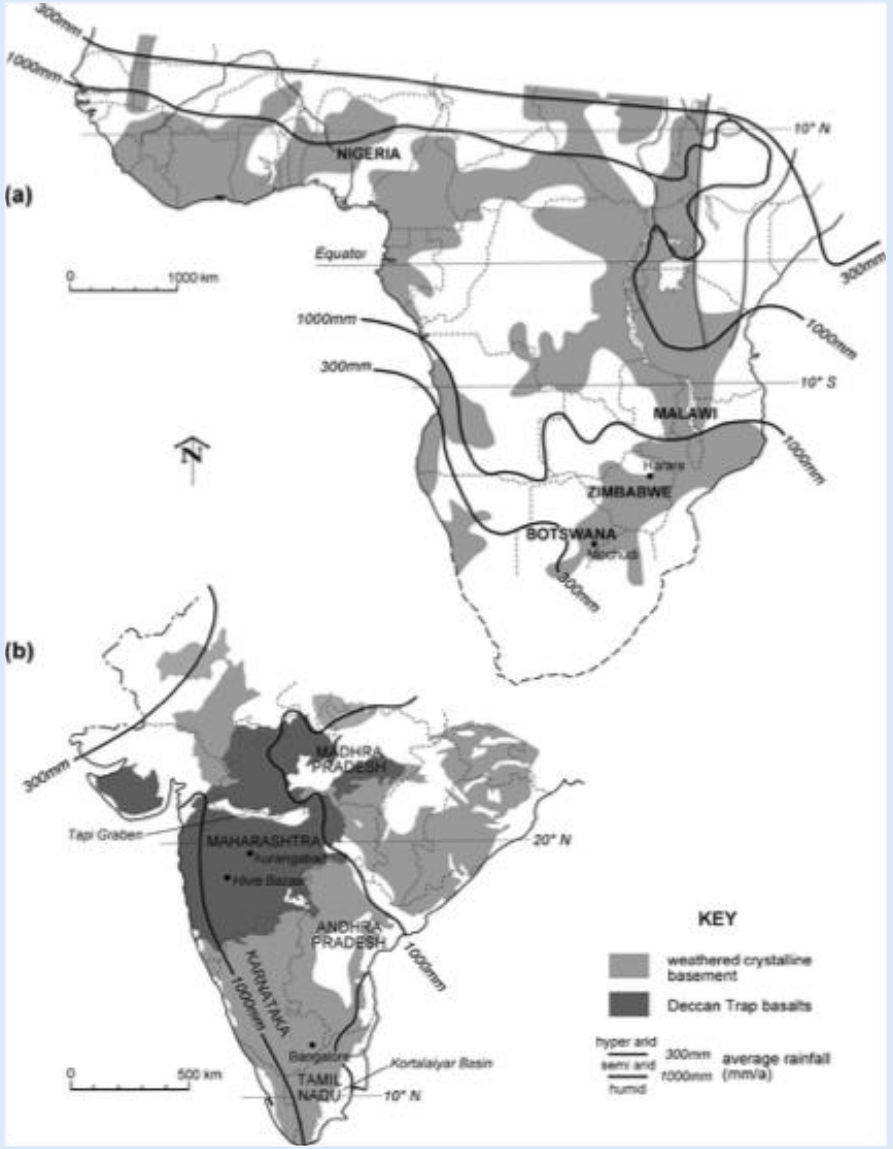


Fig. 1 Location maps for **a** Sub-Saharan Tropical Africa and **b** Peninsular India showing the general distribution of hard-rock aquifers

Source: Foster, Stephen. 2012. "Hard-Rock Aquifers in Tropical Regions: Using Science to Inform Development and Management Policy." *Hydrogeology Journal* 20 (4): 659. https://search.proquest.com/openview/f0ce92cc657b9ec1fc79ac02cb140ce7/1?pq-origsite=gscholar&cbl=55405.

Nexus governance 1: Shallow groundwater for multiple use

- Build on and sustain Ethiopia's successes in expanding access to groundwater for drinking
- Opportunities: food, income, access, clean energy
- Threats: Equity, sustainability
- Impacts of intensified groundwater extraction already emerging in some places
- Shallow groundwater may also be linked to deeper aquifers and so need to be managed together
- Packaging promotion with education, participatory monitoring, and developing capacity to resolve conflicts
- Learning together – local knowledge and hydrogeology
- Like a choice of whether to drive in the dark or turn on headlights

How could policy support participatory monitoring and management at multiple scales, informing sustainable development for multiple use?

Source: IWMI Flickr Photos
Using a solar-powered water pump to pump groundwater in Ethiopia
Photo credit: Maheder Haileselassie / IWMI
https://www.flickr.com/photos/iwmi/51437047915

Gowing, John, David Walker, Geoff Parkin, Nathan Forsythe, Alemseged Tamiru Haile, and Demis Alamirew Ayenew. 2020. "**Can Shallow Groundwater Sustain Small-Scale Irrigated Agriculture in Sub-Saharan Africa? Evidence from NW Ethiopia**." *Groundwater for Sustainable Development* 10:100290. https://doi.org/10.1016/j.gsd.2019.100290.
Nigussie, Likimyelesh, Jennie Barron, Alemseged Tamiru Haile, Nicole Lefore, and J. Gowing. 2018. "**Gender Dimensions of Community-Based Groundwater Governance in Ethiopia: Using Citizen Science as an Entry Point**." IWMI Working Paper 184. Colombo, Sri Lanka: International Water Management Institute. https://hdl.handle.net/10568/97655.

Nexus governance 2: Enhancing recharge and sharing storage

- Maintaining or restoring groundwater stocks and their benefits
- Ensuring reserves will be available for droughts – as underground reservoirs
- Several recharge opportunities in Ethiopia
  - Watershed conservation
  - Roads for groundwater
  - Conjunctive irrigation management
  - Managed aquifer recharge with surface water or treated wastewater
- Consider: Who benefits?
- Negotiate and plan recharge sharing in advance

How can policy support deliberate and systematic enhancement of groundwater recharge, including equitable sharing and ensuring reserves for droughts?

Fig. 4. Examples of the interventions at different parts of the landscapes: (a) SWC at upper sections of the landscapes, (b) gabion check-dam integrated with biological measures, (c) sand dams for sediment and groundwater storage and recharge, and (d) shallow groundwater wells developed at lower parts of the landscapes.

Woldearegay, Kifle, Berhane Grum, Rudi Hessel, Frank van Steenbergen, Luuk Fleskens, Eyasu Yazew, Lulseged Tamene, Kindu Mekonnen, Teklay Reda, and Mulu Haftu. 2024. "**Watershed Management, Groundwater Recharge and Drought Resilience: An Integrated Approach to Adapt to Rainfall Variability in Northern Ethiopia**." *International Soil and Water Conservation Research* 12 (3): 663–83. https://www.sciencedirect.com/science/article/pii/S2095633923000710.

Richard-Ferroudji, Audrey, T. P. Raghunath, and G. Venkatasubramanian. 2018. "**Managed Aquifer Recharge in India: Consensual Policy but Controversial Implementation**." *Water Alternatives* 11 (3): 749–69. https://www.water-alternatives.org/index.php/alldoc/articles/vol11/v11issue3/463-a11-3-16/file.
Saidani, Mohamed Amine, Uma Aslekar, Marcel Kuper, and Jeltsje Kemerink-Seyoum. 2023. "**Sharing Difficult Waters: Community-Based Groundwater Recharge and Use in Algeria and India**." *Water Alternatives* 16 (1). http://dx.doi.org/10.2499/9780896291720.

Nexus governance 3: Governing groundwater linkages with surface water

- Springs, wetlands, groundwater dependent ecosystems and baseflows to streams, rivers, and lakes at risk, and can impact domestic water sources
- Consider environmental impacts and tradeoffs
- Monitor between recharge and discharge areas (to detect trends while there is time to act
- Avoid, minimize, or mitigate harm to existing uses, including domestic use and ecosystems
- Nature-based solutions; Protect and restore environmental services
- Need to govern across boundaries, at multiple scales

How can policy support coordination at multiple scales to deal with key linkages between groundwater and surface water, identifying and managing tradeoffs and synergies

Fig. 6.1 Wetlands and open water bodies in Ethiopia; YTVL- is an E–W running volcano tectonic lineament zone with a width of 60 km and hosting several wet lands in western Ethiopia names of wetlands are given in text

Source: Kebede, Seifu. 2013. **Groundwater in Ethiopia: Features, Numbers and Opportunities**. Springer Hydrogeology. Berlin, Heidelberg: Springer Berlin Heidelberg. p. 209. https://doi.org/10.1007/978-3-642-30391-3.

Eamus, Derek, Baihua Fu, Abraham E. Springer, and Lawrence E. Stevens. 2016. "**Groundwater Dependent Ecosystems: Classification, Identification Techniques and Threats**." In *Integrated Groundwater Management: Concepts, Approaches and Challenges*, edited by Anthony J. Jakeman, Olivier Barreteau, Randall J. Hunt, Jean-Daniel Rinaudo, and Andrew Ross, 313–46. Springer.

Water tenure assessment and water allocation

- Many kinds of rules and norms shape access to water
- Unbundling property rights: tenure may include rights to access, use, improve, or (possibly) transfer
- Better to first build on existing institutions for governing shared natural resources (commons)
- Strengthen recourse and remedies: capacity for dispute resolution, grievance procedures, and mediation, as well as local authorities and courts
- Water tenure assessment can help understand formal law, customary law and practice and other institutions (legal pluralism) and how they shape water use, including conflict resolution
- Focusing formal permitting and volumetric control on large scale users may be more effective

How can policy support and draw on the capabilities of multiple institutions, formal and informal, for governing water?

Water tenure assessment: Senegal field visit 2019
https://www.fao.org/in-action/knowat/country-activities/senegal/water-tenure-assessment/en/

Hodgson, S., A.-K. Rothe, S. Espinosa Flor, J. Troell, and B. Kiersch. 2024. *Water Tenure Assessment*. FAO.
Schreiner, Barbara, and Barbara Van Koppen. 2018. "Establishing Hybrid Water User Rights Systems in Sub-Saharan Africa: A Practical Guide for Managers." Colombo, Sri Lanka

Polycentric governance

- Governance institutions at multiple levels and scales
- Combining top-down, bottom-up, sideways (peer-to-peer) and diagonal (cross-scale)
- Distribute power, decisionmaking, and learning
- State-supported autonomy
- Problemsheds may link relevant stakeholders
- Applying an Institutional Analysis and Development framework (IAD) can help understand and develop policycentric governance

How can policy support polycentric governance so actors at multiple levels and scales have authority and resources to solve problems?

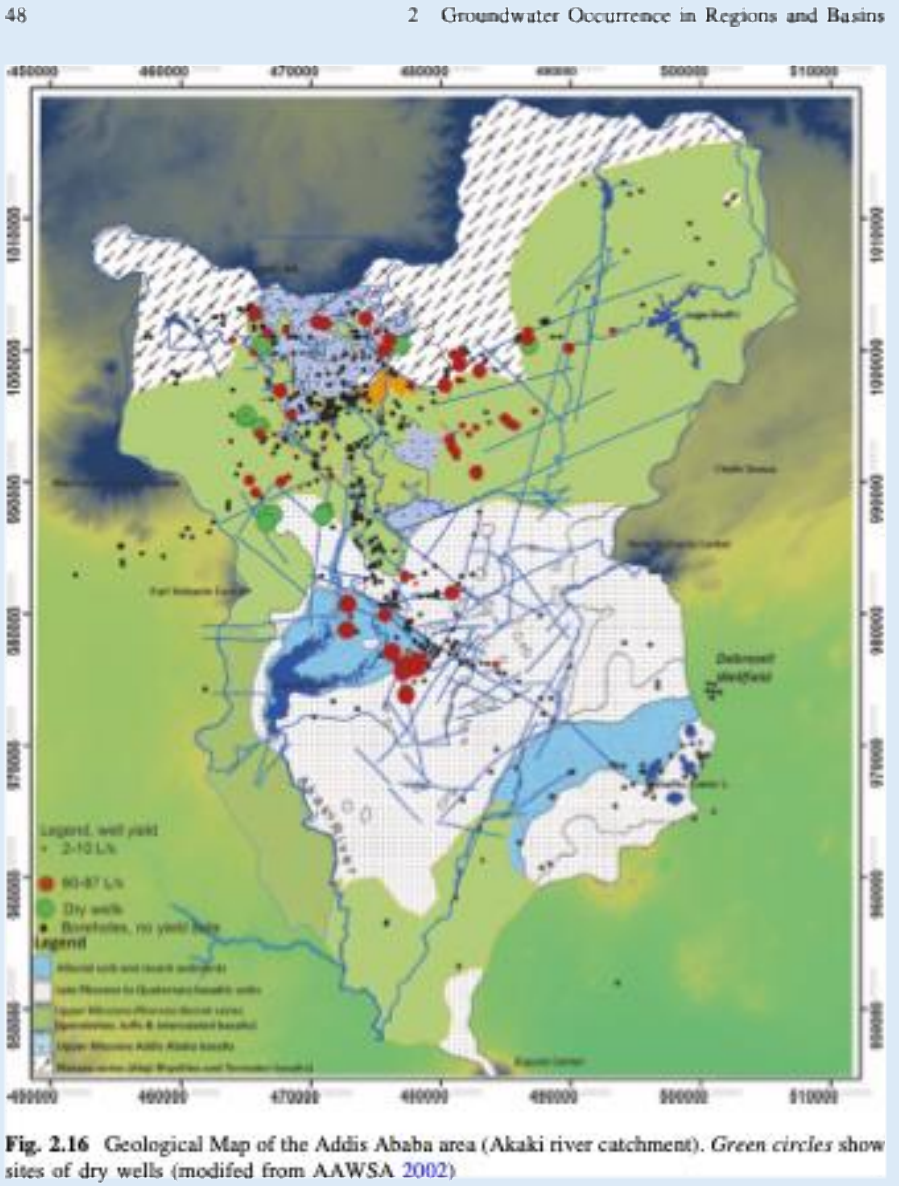


Fig. 2.16 Geological Map of the Addis Ababa area (Akaki river catchment). *Green circles* show sites of dry wells (modifed from AAWSA 2002)

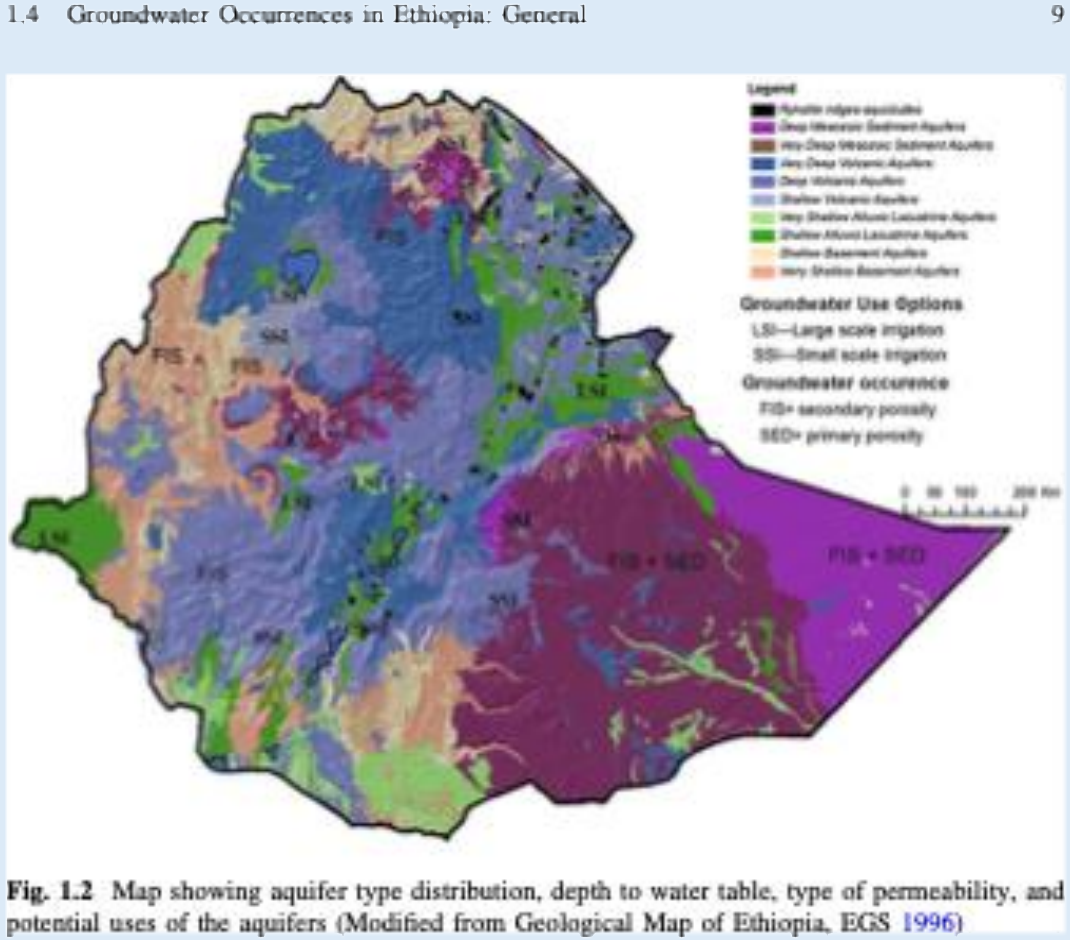
Bruns, Bryan. 2021. "**Polycentric Solutions for Groundwater Governance in Sub-Saharan Africa: Encouraging Institutional Artisanship in an Extended Ladder of Participation**." *Water* 13 (5): 630. https://doi.org/10.3390/w13050630.

Source: Kebede, Seifu. 2013. Groundwater in Ethiopia: Features, Numbers and Opportunities. Springer Hydrogeology. Berlin, Heidelberg: Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-30391-3.

Conclusions

- Many tools for groundwater governance, but often ineffective, need to customize to **fit contexts**
- **Start from actors**, rather than starting from tools or rules, consider their knowledge, motivation, and agency
- **Involve stakeholders** in choosing and combining tools to fit their problems and priorities
- Nexus governance opportunities:
  - **Shallow groundwater** for multiple use
    - Participatory monitoring and management
  - **Enhancing** recharge and sharing storage
    - Planning and negotiating to share and ensure reserves for drought
  - Governing **groundwater linkages** with surface water, at multiple scales
    - Integrate planning and avoid, minimize and mitigate negative impacts

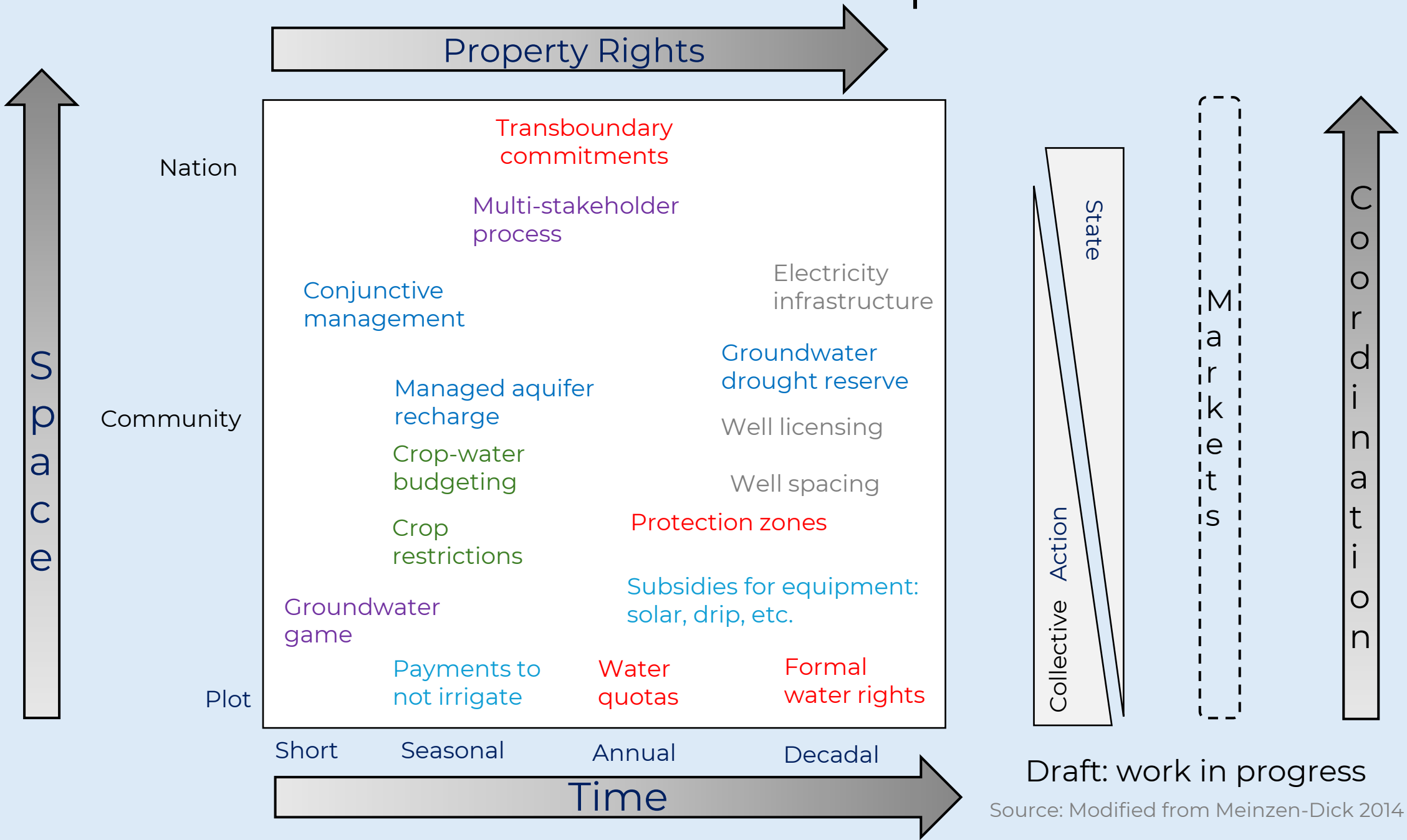
How could policy support these?



Source: Kebede, Seifu. 2013. Groundwater in Ethiopia: Features, Numbers and Opportunities. Springer Hydrogeology. Berlin, Heidelberg: Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-30391-3.

Extra slides

Institutional Tools across Time and Space



Draft: work in progress

Source: Modified from Meinzen-Dick 2014

Water rights principles and lessons

- Proportional shares of available water
- Limited duration with periodic review
- Relate rights to consumptive water use - beneficial evapotranspiration
- Account for return flows
- Water user associations and other groups can hold and govern collective rights
- Beware that increased efficiency may increase use (rebound effect/Jevons paradox)
- Avoid unnecessary “giveaways” and beware of “water grabs”

KMA Framework: Actors and their knowledge, motivation, and agency

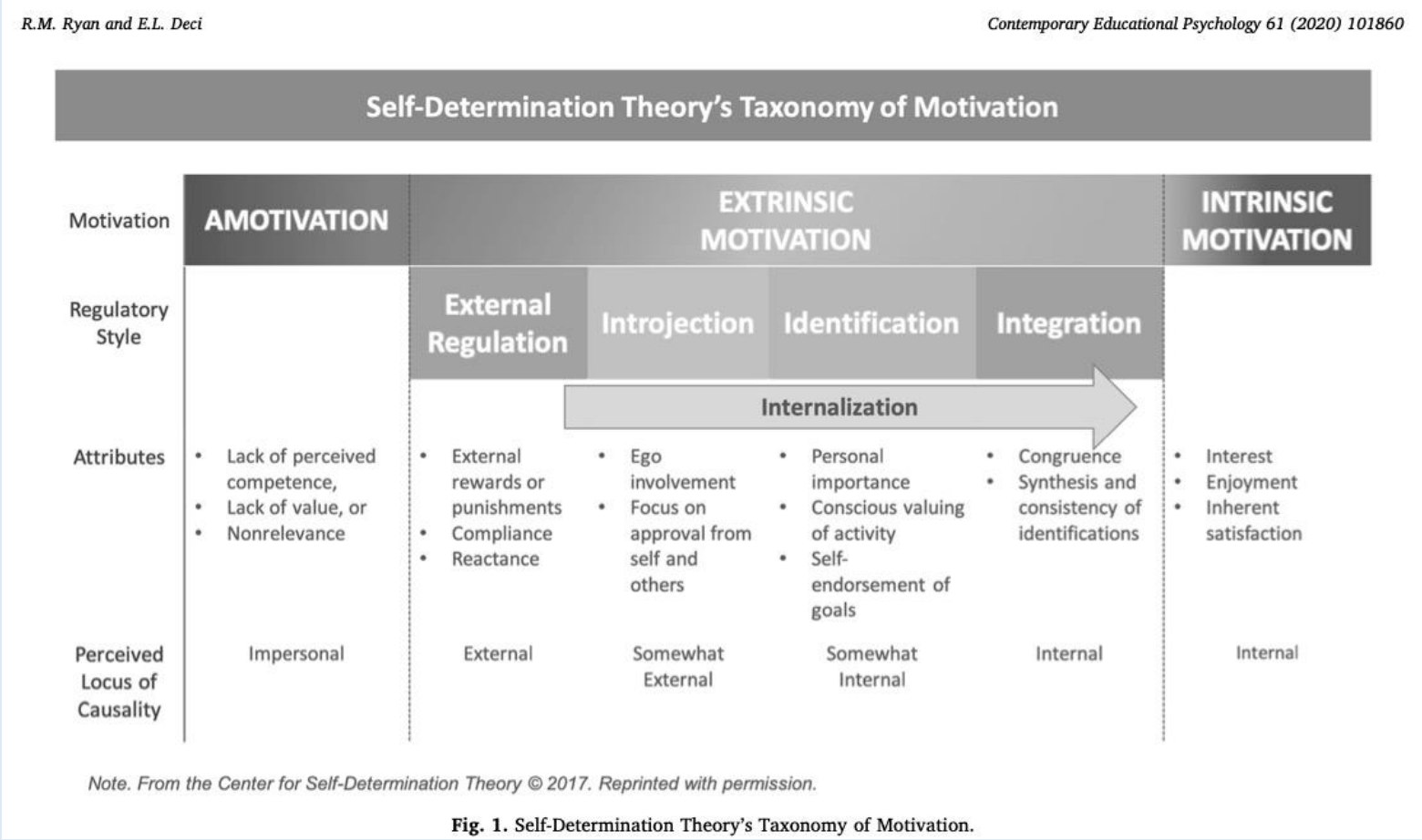
- Start with the actors, not with tools
- Identify stakeholders
- Analyze their roles and relationships to groundwater
- Engage stakeholders, e.g. in multi-stakeholder platforms
- Consider multiple motivations: external and internal
- How to make a difference - agency

Meinzen-Dick, Ruth, and Bryan Bruns. 2024. "Crafting Combinations to Govern Groundwater: Knowledge, Motivation, and Agency." *International Journal of the Commons* 18 (1). https://doi.org/10.5334/ijc.1473.

Multiple motivations

- Economic incentives
- Regulatory sanctions
- Social norms
- Personal values
- Culture and worldviews
- Intrinsic motivations

- Crowding out or crowding in internalized motivations



Learning together

- Local knowledge and hydro-geology
  - socio-hydrogeology
- Participatory monitoring
  - Citizen science
- Groundwater drillers and equipment suppliers
- Facilitating knowledge co-production

‘When the water goes down, we remember the games’: A photo story on groundwater governance in Ethiopia. IFPRI Blog: Issue Post https://www.ifpri.org/blog/when-water-goes-down-we-remember-games/

Breakout rooms

- Teams will assign people to rooms (random/shuffle)
- Each group should choose a moderator and a rapporteur (scribe/notetaker)
- Then discuss the questions, encouraging all participants to have a chance to talk
- Link for Google doc with questions will be in the Chat (main meeting room and breakout room)
- Rapporteur should note major points on the Google Doc page for their room (1,2, or 3)
- Teams will return everyone to the main meeting
- At beginning of plenary, we'll take three minutes for each person to read the Google Doc notes from the other two groups
- Then we'll begin plenary discussion

Questions:

Q1 What are key priorities for improving groundwater governance policy and practice in Ethiopia?

Q2 What are next steps for improving groundwater governance policy and practice in Ethiopia?