FERNANDA S. M. JESUS

DISCIPLINA: CST-310-3 POPULAÇÃO, ESPAÇO E AMBIENTE

PROFS.: DRA. SILVANA AMARAL/DR. ANTÔNIO MIGUEL VIEIRA MONTEIRO

Quantifying water vulnerability: a multi-dimensional approach

CAROLINE A. SULLIVAN

STOCHASTIC ENVIRONMENTAL RESEARCH AND RISK ASSESSMENT, VOL. 25, NO. 4, P. 627-640, 2011

(IF 2015 = 2.629/ QUALIS CAPES - CIÊNCIAS AMBIENTAIS = A2)

Contextualização

Water Poverty Index (WPI)

Sullivan (2001)

Índice de gestão dos recursos hídricos baseado no IDH

Projeto internacional financiado pelo UK´s Department for International Development

Climate Vulnerability Index (CVI)

Sullivan e Meigh (2005)

Incorpora aspectos geográficos de vulnerabilidade e utiliza cenários de mudanças climáticas

Utilizado pela UNECE e Banco Mundial

Water Vulnerability Index (WVI)

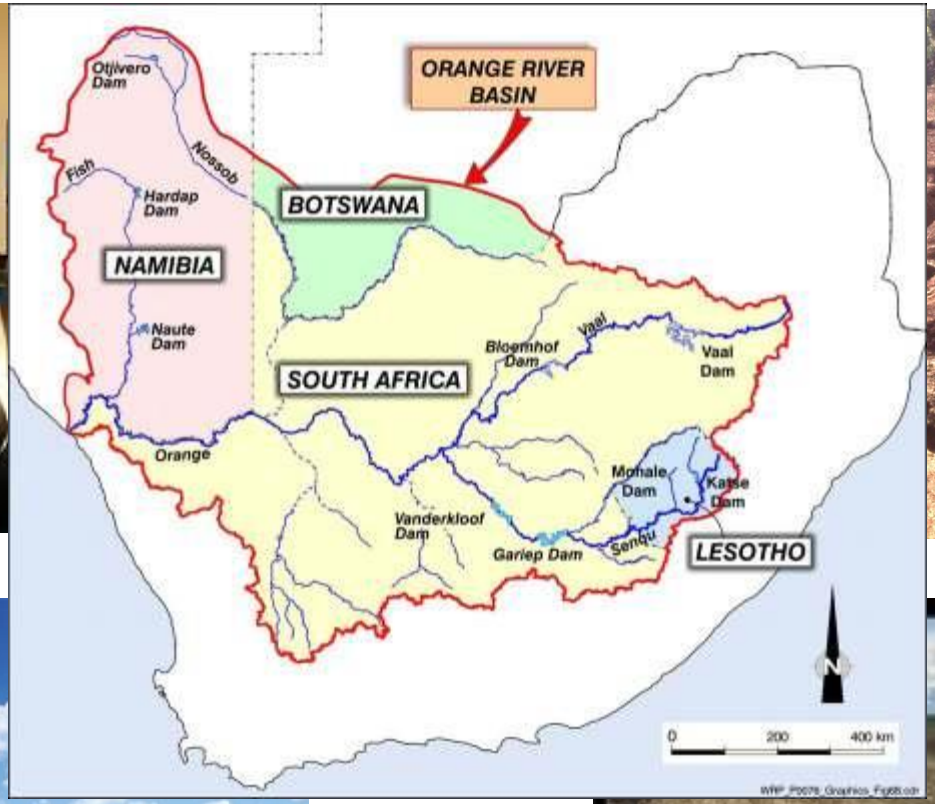
Sullivan (2011)

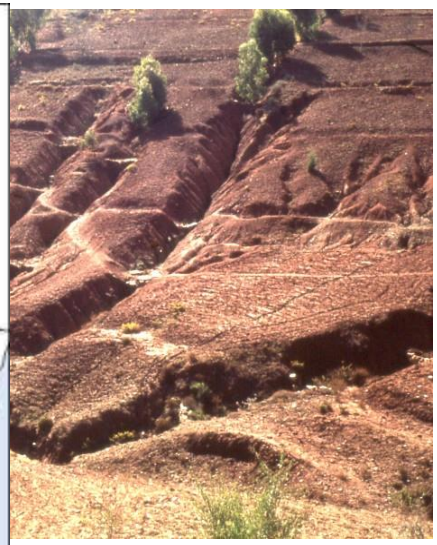
Foca na vulnerabilidade hídrica e impactos em vários aspectos da economia e sociedade

Introdução

- ✓ Mudanças climáticas: incremento ou redução da precipitação, aumento da temperatura, eventos extremos
- ✓ Gestão: identificação de regiões que requerem mais implementação de ações para adaptação de maneira priorizar investimentos
- ✓ Compreensão dos motivadores das mudanças, dos estados e das respostas potenciais

Avaliação das condições atuais e os fatores que afetam → Identificação dos cenários futuros mais prováveis → Aplicação desses cenários nas condições futuras


ORANGE RIVER BASIN
Otjivero Dam
Fish
Noasob
Hardap Dam
BOTSWANA
NAMIBIA
Naute Dam
SOUTH AFRICA
Bloemhof Dam
Vaal
Vaal Dam
Orange
Mohale Dam
Katse Dam
Vanderkloof Dam
Gariep Dam
Senqu
LESOTHO
N
0
200
400 km



Área de estudo

Municípios de outros países não foram analisados por falta e inconsistência de dados

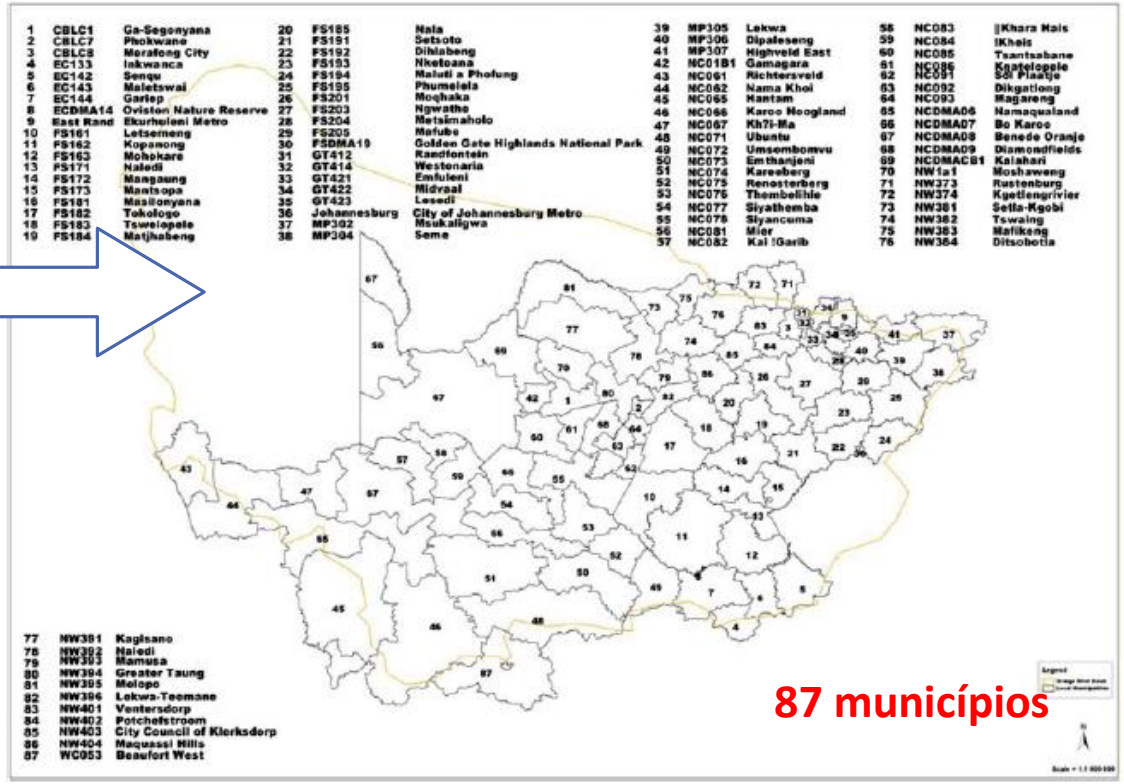


Fig. 4 Cases used as pilot tests for the WVI. Eighty seven local municipalities in the South African portion of the Orange River Basin. *Source*: Diederichs et al. (2008)

Water Vulnerability Index (WVI)

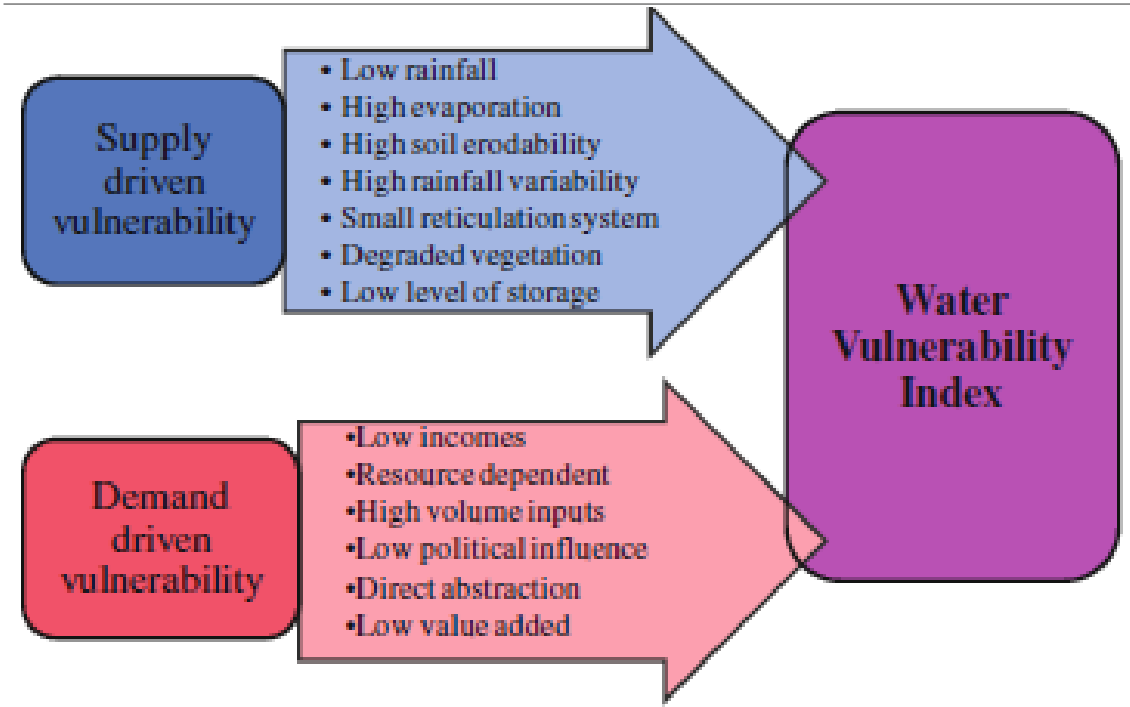


Fig. 3 Characteristics of supply-driven water vulnerability (water systems) and DDWV (water users)

Investigação das percepções locais quanto vulnerabilidade hídrica (Romero, 2007)

Entrevistas e workshops

Disponibilidade de dados e opinião de especialistas

Water Vulnerability Index (WVI)

Water resource supply	
Resource vulnerability	Mean annual run-off including upstream contributions (normalized and inverted)
	Annual groundwater exploitation potential (normalized and inverted)
Extreme event vulnerability	Number of days per annum where rainfall = 0 mm (normalized)
	Days per annum with rainfall >25 mm (normalized)
Land cover vulnerability	Percentage cover of urbanisation upstream
	Percentage cover of irrigated land
Storage vulnerability	Dam coverage (Ha per capita) (normalized and inverted)
	Coefficient of variation of mean annual precipitation

Universidade da África do Sul (KwaZulu-Natal)

Department of Water Affairs and Forestry (DWAF)

Council for Scientific and Industrial Research (CSIR)

Water Vulnerability Index (WVI)

Water resource users	
Demographic vulnerability	Total population (normalized)
	Population density (persons/ha) (normalized)
Household vulnerability	Percentage of economically vulnerable households
	Percentage households using water from direct resource
Economic vulnerability	Percentage employment in water-dependant sectors (agric, manufacturing, mining)
	Percentage GVA in water-dependent sectors (agriculture, manufacturing, mining)
Bulk demand vulnerability	Total annual water demand (normalized)
	Evaporative demand (mm/annum) (normalized)

Statistics South Africa

Global Insight Southern Africa

Department of Water Affairs and Forestry (DWAF)

Universidade da África do Sul (KwaZulu-Natal)

Water Vulnerability Index (WVI)

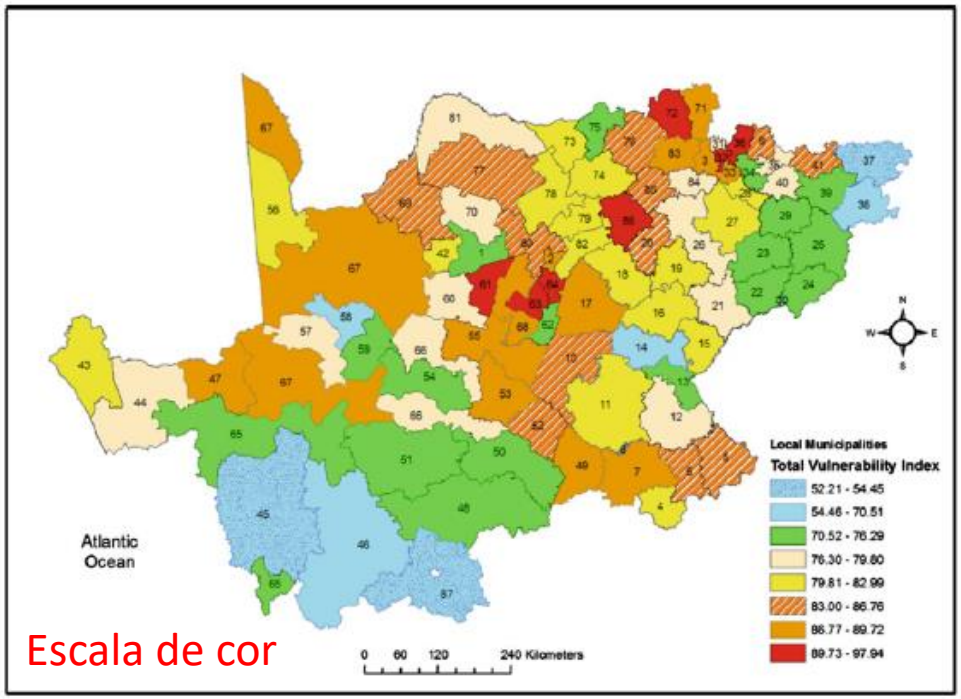
suprimento demanda

$$WVI = SDWV + DDWV$$

$$WVI = \frac{\sum_{i=1}^{N} r_i x_i}{\sum_{i=1}^{N} r_i}$$

Quanto mais provável levar uma condição vulnerável, maior o peso L-M-H (especialistas)

Resultados



Escala de cor

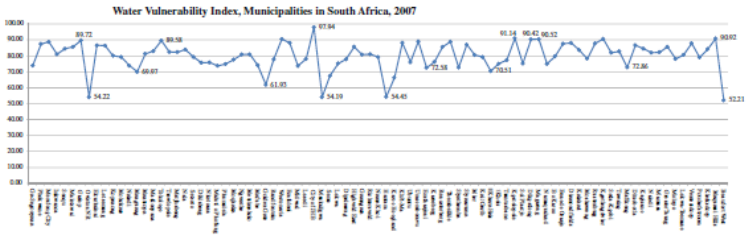


Fig. 6 WVI scores for South African municipalities in the Orange Basin

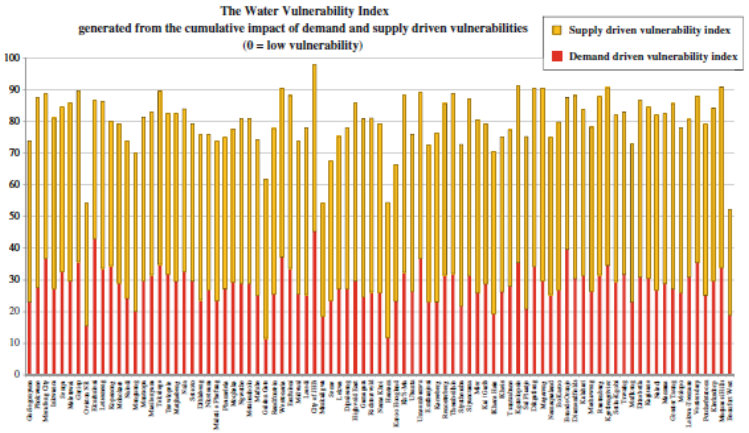


Fig. 7 WVI: combined demand and supply driver values

Resultados

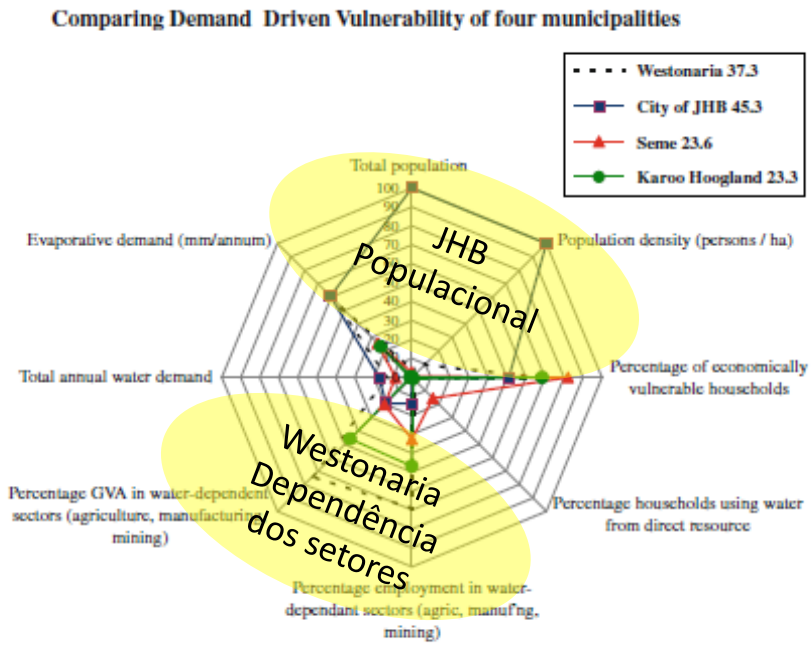


Fig. 9 Illustrating DDWV

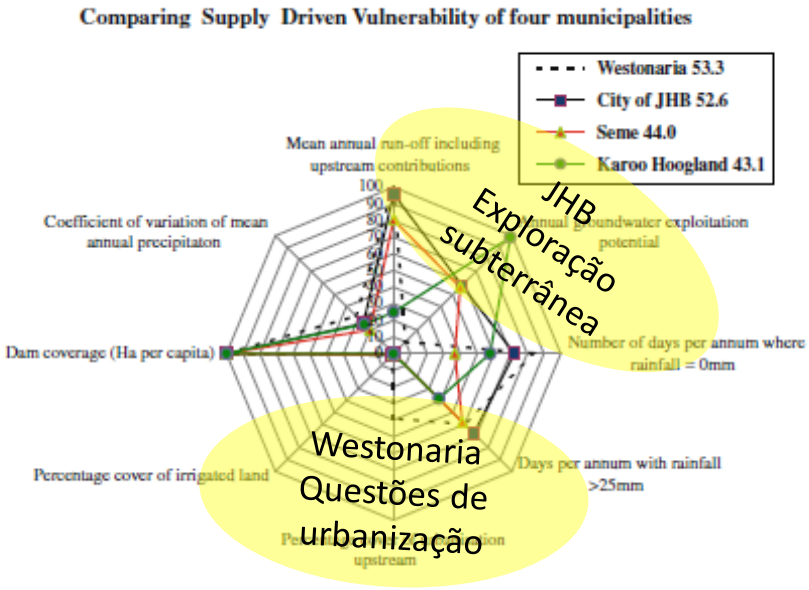


Fig. 10 Illustrating supply-driven water vulnerability

Cenários

Table 5 Comparing vulnerability profiles over time (hypothetical scenario)

	Westonaria	City of JHB	Seme	Karoo Hoogland
Original total WVI	90.6	97.9	67.6	66.4
Demand driven water vulnerability +20%	44.8	54.4	28.3	28.0
Supply driven water vulnerability −10%	47.9	47.3	39.6	38.8
Total new WVI, under climate change	92.7	101.7	67.9	66.8

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Cerca de 24%

Sullivan CA, Meigh JR, Fediw T (2002) Developing and testing the water poverty index: phase 1 final report. Report to Department for International Development, Centre for Ecology and Hydrology, Wallingford, UK
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Sullivan CA, Dickens C, Mander M, Bonjean M, Macfarlane D, Bharwani S, Matin N, van Nieukerk K, Diederichs N, Taylor A, Shale M, King-Okumu C, Kranz N, Bisaro S, Zabala A, Romero A, Huntjens P, Knoesen D (2010) Promoting adaptive water management in the Orange Senqu River Basin: a NeWater case study. In: Mysiak J, Henrikson HJ, Sullivan CA, Bromley J, Pahl-Wostl C (eds) The adaptive water resource management handbook. Earthscan, London

Agenda

Target 7.C:
Halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation

- The world has met the target of halving the proportion of people without access to improved sources of water, five years ahead of schedule.
- Between 1990 and 2015, 2.6 billion people gained access to improved drinking water sources.
- Worldwide 2.1 billion people have gained access to improved sanitation. Despite progress, 2.4 billion are still using unimproved sanitation facilities, including 946 million people who are still practicing open defecation.

Agenda

Global Water Partnership

Setting the stage for change

Second informal survey by the GWP network giving the status of the 2005 WSSD target on national integrated water resources management and water efficiency plans

February 2006

Central concepts: the IWRM approach

IWRM approach[9]
IWRM is defined as a process that promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.

This approach promotes more coordinated development and management of:

- land and water,
- surface water and groundwater,
- the river basin
- upstream and

IWRM is also ab
benefits from th
that:
- water develop
people's water n
- stakeholders a
securing the inv
- policies and p
between macroe
- water-related
conflict with, th
- water planning
goals.

Southern Africa

Status IWRM & WE plans development process

	Countries that have plans/strategies in place, or a process well underway, and that incorporate the main elements of an IWRM approach.
	Countries that are in the process of preparing national strategies or plans but require further work to live up to the requirements of an IWRM approach.
	Countries that have taken only initial steps in the process towards preparing national strategies or plans and have not yet fully embraced the requirements of an IWRM approach.
	Countries that have not submitted a survey reply, or been included in the survey.

SOUTHERN AFRICA

Conceito Mediador

Vulnerabilidade hídrica

Vulnerabilidade abastecimento de água

Vulnerabilidade (UNEP, 2002):

- “interface entre exposição e ameaças físicas ao bem estar humano e a capacidade das pessoas e comunidades em lidar com elas. Ameaças derivam da combinação de processos sociais e físicos. Vulnerabilidade humana integra várias questões ambientais.”

Vulnerabilidade população quanto ao abastecimento de água?

Objeto Mediador

Indicadores selecionados com base em percepções locais, entrevistas, workshops, disponibilidade de dados e opinião de especialistas

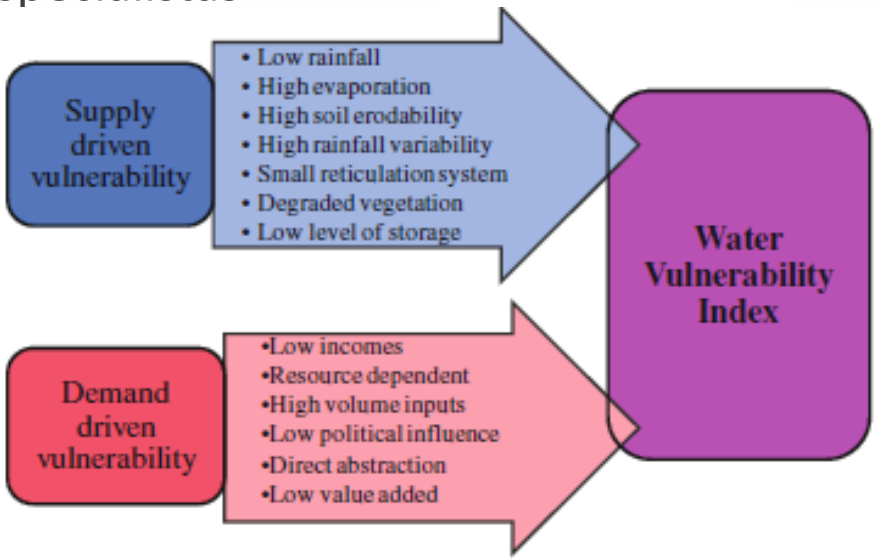

Fig. 3 Characteristics of supply-driven water vulnerability (water systems) and DDWV (water users)

Validade
Especificidade
???

Artigo de Apoio

Plummer *et al.* (2012)

A Systematic Review of Water Vulnerability Assessment Tools

Water Resour. Manag., v. 26, n. 15, p. 4327-4346

Grosbois e Plummer (2015)

Problematizing Water Vulnerability Indices at a Local Level: a Critical Review and Proposed Solution

Water Resour. Manag., v. 29, p. 5015-5035

Revisão de 7 índices de vulnerabilidade hídrica e proposição de modelo de 7 etapas para elaboração

Análise Comparativa

Modelo Conceitual e de medição

- Revisão de literatura e envolvimento dos *Stakeholders*

Fonte de Dados, Coleta de Dados e Dados Faltantes

- Dados primários e secundários

Escalas e normalização

Pesos e Agregação de Dados

- Importância relativa

Análise de Sensibilidade e Apresentação dos Resultados

- Mudanças dos resultados com alterações das premissas

Aplicabilidade e Transferibilidade

Obrigada!!!