Using Water Emission Factors

and the

National Environmental / Policy Contexts

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1. Origins of NAMA Water Components and Roles of Water in MRV

Each NAMA is uniquely embedded in national policy in a country. Among the advanced NAMA currently in planning four involve water and the role of a water emission factor in MRV is also unique for each one. The upper two NAMA are integral, the lower two adjacent to climate policy:

Mexico started from an operational PoA with a new methodology, the first housing sector oriented, AMS-III.AE, with over 1 mio. green mortgages since 2009 = nat. housing regulator uses mitigation to steer the housing mortgage sector + public funds for zones of Mexico City, around transport, health and education services, densification of zones, counters urban sprawl + Urban NAMA to add to this PoA public lighting, water and waste services with emission intensity targets (water 0.23 tCOe/yr), to be achieved by Mexican privately funded USCOs with suite of renewables and efficiency technologies = redefines urban development policy by integrating all energy factors around housing with a pool of multilateral and national funds	**Jordan** started with a long list of 51 NAMA candidates collected by multidonor PPIAF, a workshop then selected a final shortlist of 5, and as the first priority: Zarqa Ind. Wastewater Treatment Plant (ZIWWT), replaces the Al-Samra CDM project + regulation for aid sector transformation = builds private and public sector capacities to reuse water, maximise biogas and sludge, and derive from this case FiT, PPP laws = better integrate different public services and meet public sector shortfalls with new sources of investment = innovate mitigation and adaptation in ways to extend development aid that has struggled with water scarcity and governance
Thailand started with assessment of waste and wastewater sector, inventory of current activities, realistic improvements and GHG emission reduction potential 11th NESDP's objective on resilience via water management for flood prevention, alleviate shortages, expand irrigation = implementation focus on the level of urban water systems = NAMA comprises wastewater option for cities to invest in wastewater treatment, independent of domestic VER crediting by Thai GHG Mgmt Organisation = NAMA funds can complement the new National Economic & Social Plan, however, the oversight and governance is uncertain.	**India** Climate policies in Ministry of Power: sectoral Perform Achieve and Trade PAT Ministry of New and Renewable Energy: off-grid renewable energy certificate Ministry of Environment and Forests: wastewater treatment in Ganges basin co-exist and only last one proposes NAMA. = wastewater NAMA to address the cities >100.000 inhabitants not dealt with in the past Ganga Action Plan (97 of 181 cities). Focus is pollution reduction with mitigation as co-benefit. = the water part is separate of India's climate policy instruments and is conditional on foreign NAMA funding.

A water emission factor can be central in MRV, an add-on to include all emission impacts or an output variable. Existing PoAs can influence NAMA's mitigation scope. Although a water emission factor tool is universal, both the NAMA approach and the national policy background determine the impact the tool application can have.

<table>
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<td>Mexico
NAMA extends economic and social policies, pursued by government agencies, over time build national strategies and approaches using UNFCCC instruments.
Strong national bodies pursue genuine national policy and major economic sectors, no attention to foreign funds. The PoA is part and parcel of national policy and intrinsic quality of PoA has a strong enabling impact.
MRV is part and parcel of policy design because mortgage conditions of loans and subsidies anticipate the cost of insulation, SWH, lights, etc. for house owners, and likewise loans for services providers in water and waste (efficient pumps, waste-water biogas, landfill gas, etc.). This influence evolves and with it total housing efficiency levels, mortgage terms are updated regularly.
Thus monitoring uses the same data as verification for housing. Water part MRV can be <u>sector or technology derived</u> and does not involve the loan design as for housing. Instead water part MRV reflects physical grid differences, setting baselines.</td>
<td>Jordan
Subsidies for water and electricity are partial causes of inefficiencies. This NAMA seeks to overcome policy failures by creating new water-energy-agriculture linkages.
National policy problems addressed with foreign funds and international climate policy goals are translated to national climate change problems. PoAs have distinct influence, changing national politics by their funding objectives.
The MRV operates at installation level, but the performance of ZIWWT must be related to uncertain parameters. Baselines include approximated volumes and levels of unmet water demand.
MRV parameters are useful for national water sector policy but remain incomplete as verification. Although a project NAMA, the emission reduction is a <u>sector outcome</u> with signal-to-noise uncertainties. PPIAF members and Ministries have different water models (WEAP of Jordan Valley) to evaluate the ZIWWT physical results.</td>
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<td>Thailand
The country is divided regionally in two large water utilities with uncertain buy-in to NESDP and the initiative rests with the large municipalities.
Wastewater NAMA might compete with PoAs on AMS-III.H in Thailand, and CDM projects run by SouthPole, Sumitomo, J-Power, Marubeni and Mitsubishi.
MRV is separate from NAMA design, can build on AMS-III.H, need to integrate parameters that document the resilience aspects such as flood impact, re-use potential for shortages. Potential that MRV remains inoperable with the watershed or water supply geography that determines resilience.</td>
<td>India
This NAMA puts large foreign funds to new national ends (National Ganga Mission), unconnected to nationally prominent policy instruments. NAMA as instrument is not received or translated into national policy, unlike PoA.
Wastewater NAMA choice intended to show participation in new UNFCCC instruments. Water PoAs can run their course but do not influence water NAMA (example irrigation pump PoA of BEE , AMS-II.P, and BEE's CFL PoA).
Monitoring for Ganges wastewater treatment can build on CDM methodologies, reporting is extensive to demonstrate the use of foreign funding.</td>
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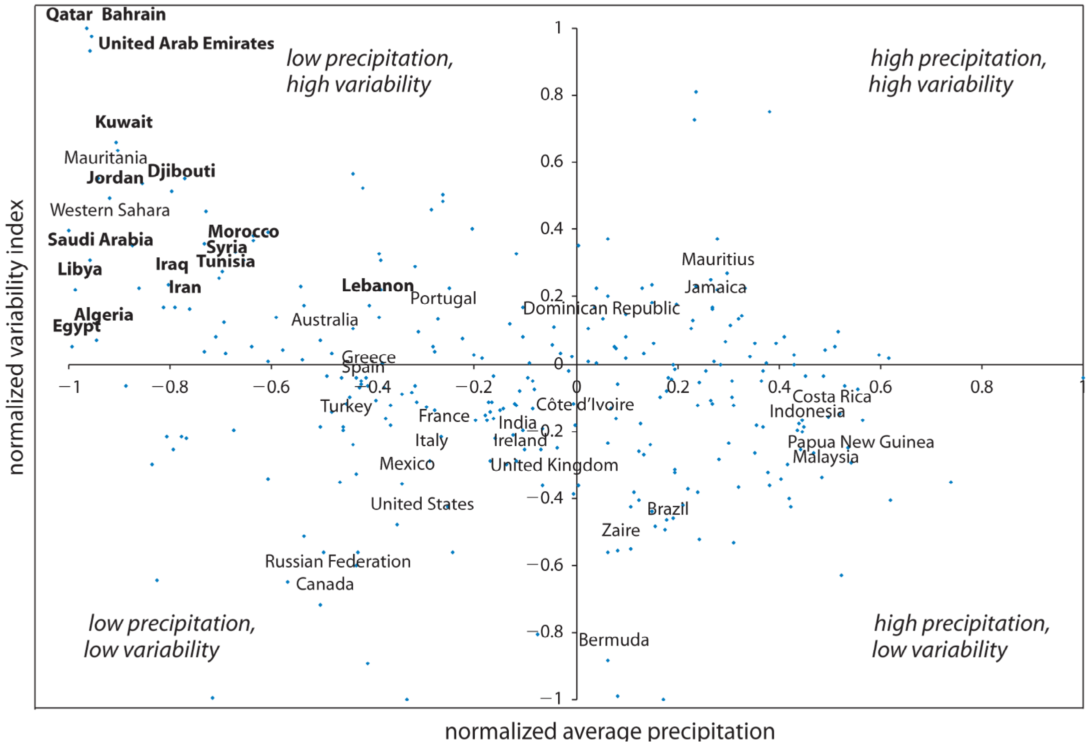
2. Mitigation / Adaptation Relation for Public Water Projects

Climate change resilience is the ability to withstand sudden changes in environmental conditions and flooding and drought are the most severe. The impact of water projects varies mostly with rainfall patterns. The resilience benefit is strongest in the upper left countries in the following graph. Mauretania, Mali, Niger, Burkina Faso, Chad, Sudan and Djibouti are extremely water scarce and for the same reasons also aid dependent.

Figure 1:

The Unusual Combination of Low Precipitation and High Variability in MENA Countries



Applications of a water emission factor <u>have high adaptation</u> co-benefits. Only one of these LDCs, Djibouti, has a major climate project, a wind driven desalination plant (and the tool can be used). All others are included in the same worldwide PoA with AMS-III.AV run by SouthPole Carbon, focusing the population without access to a water grid, typically 50 - 60%. The aid legacy of rural water (boreholes, handpumps) is strong. No climate financed activities exist in the public grids in these countries. Besides these LDCs in the upper left of the above graph, Jordan has the highest vulnerability and has the first water focused NAMA.

A separate group of countries for the mitigation/adaptation relation are the LDC SIDS Kiribati, Samoa, Solomon Islands and Vanuatu. Rising water levels and frequent flooding lead to more salt infiltration of groundwater sources and these islands become uninhabitable. None of these countries have desalination capacity. In these LDC SIDS, applications of the water tool have <u>high adaptation benefits and much smaller</u> mitigation benefits (water supply is not energy intensive).

A third type of mitigation/adaptation relation is in LDCs outside Africa. Bangladesh, Bhutan, Cambodia, Laos, Myanmar and Nepal have sufficient surface water and adaptation issues relate to flooding. Establishing a water emission factor can have some adaptation benefits by improving water supply resilience and <u>mainly mitigation</u> benefits.

3. Typology of Tool Application Factors

Institutional factors for the water sector are similarly important as the environmental context. Among public service utilities, for electricity, telephone, transport etc, water utilities are often the most deeply embedded in the national political history. The tool application in water utilities depends on their inclination and ability to plan, to pursue DSM-type water projects and new investments in maintenance. Besides being a precondition for using climate finance in water, a water emission factor can have more important uses in utilities in a variety of ways.
Four different contexts of water emission factor uses are suggested, assuming utilities in each of the contexts have similar capacities. In the following Table water sector parameters important for water utilities are in the following order:
CIF funds used, NAMAs proposed, Non-revenue water (NRW) % losses in the large cities' water grids, water availability when less than 24 h/d, % of HH with sewer connection, annual water used per capita, % agriculture with irrigation.

① Tool impact mainly through OPEX large nat. programs + commercial loans, strong privates, strong PoAs, NAMAs Philippines CIF varied, no NAMA NRW 57-17% 78% 874m^3/y 50% Mexico CIF, NAMAs similar diverse NRW 43% 81% 703m^3/y >80% South Africa CIF, NAMAs similar diverse NRW 11-30% 59% 272m^3/y <20% Thailand CIF only with CDM wind and PV NRW 26-33% 96% 845m^3/y <40%	**② Tool impact by better accounting, new incentives** water scarcity ⇔ aid fund traditions in water ⇔ownership pbs ⇔ no CDM CMEs or PPs Jordan CIF all CSP, NAMA wastewater NRW48% 4h/week 85% 150m^3/y >80% Tunisia CIF all CSP, NAMA Plan Solaire NRW 17% 85% 385m^3/y <20% Morocco CIF similar to NAMAs diverse NRW 29-21% 72% 270m^3/y 50%
③ Tool impact through project type increasing scarcity challenges institutions, carbon finance are rents to capture Bangladesh CIF only CZM, no NAMA NRW 29% 3h/d 36% 241m^3/y 42% Pakistan no CIF, no NAMA NRW 42% 8h/d 58% 184m^3/y 77% Vietnam small CIF projects, cement NAMA NRW 32% 65% 965m^3/y 53% Kenya CIF geothermal, no NAMA NRW 38% 16h/d 30% 72m^3/y 67% Ethiopia small CIF, rail NAMA NRW 36% 21% 80m^3/y 90%	**④ Tool brings policy attention to instruments** carbon finance only as national resource mgmt, aid funds isolated, poor service is equity issue, all no CIF, small NAMA Brazil NRW 40% 77% 306m^3/y <20% China NRW 10-26 65% 410m^3/y 50% Indonesia NRW 34% 52% 517m^3/y 50% Malaysia NRW32-21% 94% 488m^3/y >60%

① countries with expensive and deficient water grids, under increasing stress and which have nationally driven and elaborate climate policy.
Water grid and policy context both favour using water emission factors to inform investment decisions. The energy intensity clarifies the variable cost of water supply, the OPEX, its reduction potential and adds the value of carbon.

② water scarce countries with major inefficiencies from water governance (and high losses). Often costs are not known or not transmitted to those who cause them. These countries are also aid dependent, actively seek CIF and NAMA funds and translate international climate goals into national efforts. Tool impact is potentially strong when the emission factor takes various data sources and assembles their accounting. The water scarcity is the root of the governance inefficiencies and better insights into operational conditions can affect these inefficiencies. The possibility to apply the tool is influenced by institutional barriers.

③ severe water infrastructure deficits, unrelated to water availability. Deficits in availability h/d, NRW and areas covered reflect low policy priorities. Aid dependency's role can overrule national climate policies, indicated by CIF and NAMAs that are not central to economic sectors such as a cement NAMA in Vietnam or railways in Ethiopia. The water sector in these countries has lower aid effectiveness than other sectors. Because of the low priority, there are many technology upgrades with good returns that even a partial application of a tool can support with climate finance. The novelty can have signification demonstration effects and multipliers.

④ countries which strong local water deficiencies that are sometimes addressed with local funding, including water concessions to the private sector. Strong climate policies are pursued (with exceptions) in parallel to foreign activities (Amazon, peatland). Water utilities can pursue water projects with climate finance that highlight the past negligence of water supply quality and supply efficiency (similar to many innovative CDM projects that were possible in these countries).

4. Kopiert aus UBA Climate Change 13/2012, Chancen und Barrieren für Technikanbieter bei CDM und JI Seiten 44 - 45

4.3.2 Techniklinie Wasseraufbereitung und Abwasserbehandlung (Reinigungsverfahren): Detailbetrachtung

Marktsituation & Zielmärkte

Für Techniken des nachhaltigen Wassermanagements besteht ein Weltmarktvolumen von derzeit 190 Mrd. Euro. Es wird prognostiziert, dass das Weltmarktvolumen bis zum Jahr 2020 auf bis zu 480 Mrd. Euro steigt, davon könnten circa 30 Prozent von europäischen Anbietern abgedeckt werden. Der World Water Council geht in den Entwicklungsländern (mit China und Indien) von einem zukünftigen Investitionsbedarf von 130 Mrd. € und damit von einer Verdoppelung der heutigen Investitionssummen aus. Das Marktpotenzial ist unterteilt in ein Drittel Wasseraufbereitung, ein Drittel Abwasserbehandlung und ein Drittel Anlagen zu

Meerwasserentsalzung, Pumpen, Membranfiltration und Wassermessung/-analytik (vgl. UBA&BMU 2007b).
Im Bereich der energieeffizienten Wasserverteilung, wie Pumpensysteme, liegt der Weltmarktanteil der deutschen Unternehmen je nach Quelle zwischen 16 und 20%. Bei den Techniken Filtersysteme und Membranfiltration weisen deutsche Unternehmen einen Marktanteil von 15 beziehungsweise 17% auf und sind damit zusammen mit den USA Marktführer. Auch in dem Bereich der Filtration mit Nanokristallen wird in Deutschland ein Marktanteil von 12% gehalten. Deutschland erzielt so für den gesamten Bereich der Wasseraufbereitung den höchsten Welthandelsanteil. Besonders hervorzuheben sind hierbei das dezentrale Wassermanagement, in dem Deutschland einen Marktanteil von 40% aufweist. Das weltweite Marktvolumen der Meerwasserentsalzung mittels Nano- und Ultrafiltration soll von heute 2 Mrd. € auf 50 Mrd. € in 2020 wachsen. (vgl. BMU 2007, UBA & BMU 2008, UBA & BMU 2009, UBA&BMU 2007b).
Die nachhaltige Versorgung wachsender Bevölkerungen mit sauberem Wasser zwingt weltweit zu effizienterem Umgang mit Wasser, vor allem in Trockenregionen wie Südeuropa, Nahost oder Afrika. Gleichzeitig haben die meisten Wachstumsmärkte und Schwellen- und Entwicklungsländer ein hohes Defizit an Wasseraufbereitungstechnik. Gemäß GTAI Branchenbarometer (GTAI 2011) bieten sich weltweit gute Marktchancen für deutsche Unternehmen, primär in Regionen mit mangelhafter Wasserinfrastruktur, insbesondere Großstädten. Mehr als 60% der chinesischen Städte haben mangelnde Wasserversorgung, mehr als 200 Millionen Bürger haben keinen sicheren Wasserzugang (Gov.cn (2011).
Russland plant für die Jahre 2011-2013 1,5 Mrd. € in die Wasserversorgung des Landes zu investieren, in Indien sind Investitionen von 9 Mrd. € in die Wasserver- und Abwasserentsorgung in 63 Städten und 650 Kommunen geplant, überwiegend durch Private Public Partnerships. Viele arabische Staaten setzen stark auf Meerwasserentsalzung. Das größte Potenzial für Membranfiltration liegt in Nahost und Nordafrika. Ein weiterer großer Markt für Nanotechnologie-Produkte im Membranbereich zur Trinkwasseraufbereitung wird in China gesehen. Es ist hier jedoch anzumerken, dass insbesondere der Bereich Membranfiltration als teure Hochtechnik vornehmlich für den Einsatz in Industrieländern interessant ist.

Diese UBA Analyse betrachtet nur Technologie-kategorien als ganzes, z.B. die Kategorie Bennstoffzelle oder Meerwasserentsalzung. Die Exportdaten und die Patentdaten stammen aus einer Untersuchung vom DIW/Fraunhofer/Berger Consultants und beziehen sich ebenfalls auf ganze Kategorien. Bei dieser Betrachtung werden die eigentlichen Technologieexporte und -dienstleistungen nicht bewertet. Meerwasserentsalzung als Ganzes wird von niemand geliefert. Das Anlagenteil Energierückgewinnung in der Umkehrosmose wird weltweit nur von 3 Herstellern geliefert (darunter KSB) und wie Marktanteile sich entwickeln wird von den Leistungsmerkmalen unterschieden. Ebenso ist Fichtner Engineering ein deutscher Dienstleister unter dreien weltweit die Meerwasserentsalzungen planen können.
CDM wird oft von den Technologieführern benutzt (Osram, Bosch-Siemens) und nicht von anderen. Die Ergebnisse dieser UBA Studie sagen nichts über die Chancen und Barrieren von Technologieführern in den jeweiligen Technologie-kategorien