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Feasibility study on Regional Manufacturing of Medicines and Health Commodities

Volume 2 (Country information)

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1. PRINCIPLES ASSUMED IN THIS STUDY

The principles listed below have been developed assuming a strong applicability of innovation theory to the stimulation of local manufacturing. Such an assumption is not unreasonable; the development of local manufacturing will in most cases rely on one of the several processes which form part of the definition of innovation, including the introduction of products, processes or forms of organisation that are new to the firm, or new to the industry, or new to the country and perhaps even new in a global sense.

In this sense, development is construed as the consequence of learning and innovation, where the latter is embodied as organisational and technical change within firms or entities, and includes not just the introduction of a new product within the firm, but also the diffusion of this knowledge within industry sectors and regions.

The related assumption is that firms are at the centre of technical innovation and by extension the commercialisation of products and services for existing or even new markets. This assumption does not preclude the importance or role of state-owned entities; these "firms" are also able to act as independent agents and may indeed be subject to competition from the private sector.

There are several reasons to place firms at the centre of development including the increasing modular and specialised nature of technology and markets, the Schumpeterian conceptualisation of innovation, and the structure of governments in developing countries. Although this placement has an ideological aspect, in that it assumes a particular set of relationships and hence roles for the state and private firms, it affords the most practical structure for the challenges of industry development in the health sector.

Given the above, a number of important normative principles are defined as follows:

1. Alongside finance and skilled human resources in a developing country, knowledge is a critical resource and access to knowledge through the provision of the appropriate infrastructure, particularly broadband ICT, must be prioritised.

2. Although knowledge may not be the single most important resource, in all countries the most critical process is learning. As a result, all learning centres and mechanisms have a fundamental role to play in developing local manufacturing.

3. Learning and innovation should be considered as the outcome of interaction; the latter is critical and depends on strong networks, especially between firms and universities, between firms themselves and between firms and knowledge centres

4. There are two forms of innovation, namely; innovation/learning by science, technology and innovation (STI) and innovation/learning by doing, using and interacting (DUI). In developing countries, DUI is critical and governments should focus on incentivising the conditions for effective DUI where possible (see later). However we also need some research and

development (R&D) capacity (part of STI) as a means of increasing local absorptive capacity for new technologies.

5. No market will be without an existing network of suppliers and manufacturers, whose relationships will depend on trust, power and loyalty, and are broadly referred to as techno-economic networks (TENs). Breaking these relationships is always challenging and resistance can be expected even when the national benefit is clear. Firms do not act automatically in national interest.

6. Technology transfer from one country to another is driven by foreign investment and by early adopters within firms. For local innovation, early adopters are therefore critical; however for industry adoption, incentives and strong followers are critical. In the case of the SADC project, the incentives for early adopters are more important since the industry (pharmaceuticals and medical devices) is in most cases underdeveloped.

7. Manufacture should strive to meet international standards of production and product/service quality, with the ultimate goal being WHO PQ equivalent, with public health and economic benefits, such as being able to supply international and global procurement programmes.

8. TRIPS flexibilities represent a real window of opportunity for less developed countries but these countries will be challenged to develop the necessary skills and infrastructure in order to capitalise on this opportunity. In other countries without the TRIPS flexibility, opportunities are available in high volume and also high margin/low volume products including pharmaceuticals with recent patent expiry or voluntary license, enteric coated products, low volume (<50 mg/dose) formulations, and paediatric dosage forms.

9. Governments should play multiple roles in respect of facilitating local manufacture including the following
    1. Strong regulator to ensure GMP and quality considerations
    2. Initial incentives and government support to ensure that local companies can survive the intense competition especially from Indian and Chinese producers
    3. Tariff reform if required
    4. Public procurement as an important means to incentive local production (market access)
    5. Provision of essential medicines list to ensure that the development efforts are focussed
    6. The role of the government is not static, strong role to play in leadership and risk taking level.

10. However the specific role of governments will depend on the maturity on the industry within each country.[1] The following graphic captures some of the essential aspects of how this role can change.[2]

[1] African Union Commission. 2007. Pharmaceutical manufacturing plan for Africa. African Union (Addis Ababa).

[2] Lundvall, B. Å. 2007. National innovation systems—analytical concept and development tool. Industry and innovation, 14(1), pp 95-119.

2. NUMBER OF HIV PATIENTS PER SADC COUNTRY

The SADC region remains the area most affected by the HIV epidemic. The region is home to an estimated 14.7 million people living with HIV; 11.7 million of them would need Anti-Retroviral Therapy (ART) based on 2013 WHO guidelines, but only 6 million (52%) were on ART in 2013:

Table 1 – Number of HIV patients per SADC country

Country	Estimated population 2013 (000s)	HIV+ prevalence	# people living with HIV	% of SADC	People needing ART based on WHO 2013 guidelines	People on ART 2013	ART coverage based on WHO 2013 guidelines
Angola	21,690	1.2%	250,000	1.7%	216,838	65,000	30%
Botswana	2,106	15.2%	320,000	2.2%	282,685	224,000	79%
DRC	77,419	0.6%	440,000	3.0%	391,571	79,200	20%
Lesotho	1,924	18.7%	360,000	2.5%	291,354	100,800	35%
Madagascar	22,853	0.2%	54,000	0.4%	45,632	540	1%
Malawi	16,310	6.1%	1,000,000	6.8%	803,801	460,000	57%
Mauritius	1,312	0.7%	9,600	0.07%	n/a	1,824	n/a
Mozambique	25,728	6.2%	1,600,000	10.9%	1,355,164	512,000	38%
Namibia	2,355	10.6%	250,000	1.7%	211,556	130,000	61%
Seychelles	86	0.5%	397	0.003%	n/a	228	n/a
South Africa	52,280	12.1%	6,300,000	42.9%	4,679,005	2,646,000	57%
Swaziland	1,287	15.5%	200,000	1.4%	168,880	98,000	58%
Tanzania	49,862	2.8%	1,400,000	9.5%	1,201,327	518,000	43%
Zambia	14,690	7.5%	1,100,000	7.5%	961,071	572,000	60%
Zimbabwe	14,029	10.0%	1,400,000	9.5%	1,155,793	672,000	58%
SADC total	***303,930***	***4.8%***	***14,683,997***	***100.0%***	***11,764,677***	***6,079,592***	***52%***

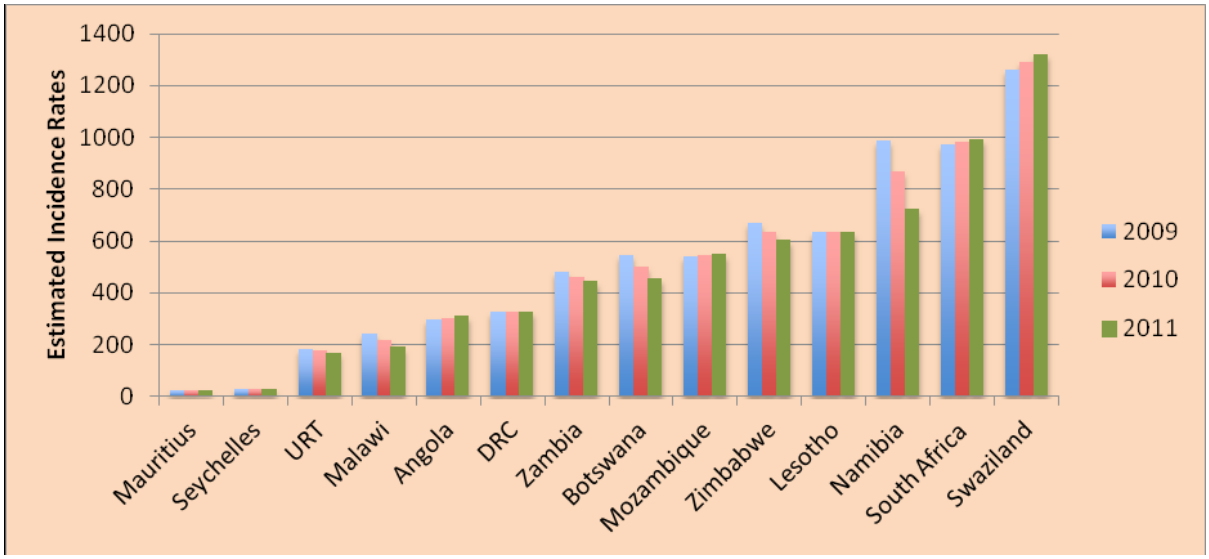
Sources: SAFAIDS/UNAIDS 2013 data; Seychelles MOH 2014 report
Note: the population figures used by SAFAIDS/UNAIDS are slightly higher than the UN 2013 population data used in the TB and malaria tables.

3. NUMBER OF TB PATIENTS PER SADC COUNTRY

The World Health Organization (WHO) estimated that globally 8.6 million new cases of tuberculosis (TB) occurred in 2012, and 1.3 million patients died of TB. The African Region has 24 percent of the world's cases and the highest rates of cases and deaths per capita. Five of the 15 countries of the SADC region are amongst the 22 global TB high-burden countries identified by the WHO. Estimated incidence rates remain high with 11/15 Member States having rates above 200 per 100,000 population (see below) resulting in large number of cases diagnosed and notified.

This situation is further complicated by the emergence of drug-resistant strains including multi-drug resistant (MDR) and extensively drug-resistant (XDR) TB: all but one Member State have diagnosed and started treatment of MDR-TB patients, and five Member States have diagnosed XDR-TB in 2012. Treatment outcomes are very poor: only 16% of people with XDR-TB were cured, and nearly half (46%) died. Treatment is also very costly: In South Africa the per patient health care cost of XDR-TB is $26,392, four times greater than MDR-TB ($6,772), and 103 times greater than drug-sensitive TB ($257). Drug-resistant TB comprises 6.1 percent of South African cases, but it consumes 32 percent of the country's total TB budget.

Figure 1 - Estimated incidence rates TB in SADC 2009-2011



Source: 2012 Annual TB Report SADC

The WHO Global TB Report 2014 lists the estimated TB patients. Please note that these are more than the number of reported cases in SADC.

Table 2 - Estimated number of TB patients in SADC (2013)

Country	Population	Prevalence Rate (p/ 100,000)	Prevalence	Mortality	Incidence rate (p/ 100,000)	Incidence	Incidence SADC
Angola	21,471,618	424	91,000	6,900	320	69,000	5.6%
Botswana	2,021,144	346	7,000	440	414	8,400	0.7%
DRC	67,513,677	548	370,000	46,000	326	220,000	17.8%
Lesotho	2,074,465	627	13,000	960	916	19,000	1.5%
Madagascar	22,924,851	414	95,000	12,000	233	53,000	4.3%
Malawi	16,362,567	134	22,000	1,500	156	26,000	2.1%
Mauritius	1,244,403	31	390	15	21	260	0.02%
Mozambique	25,833,752	542	140,000	18,000	552	140,000	11.3%
Namibia	2,303,315	651	15,000	1,300	651	15,000	1.2%
Seychelles	92,838	37	34	1	30	28	0.002%
South Africa	52,776,130	720	380,000	25,000	860	450,000	36.4%
Swaziland	1,249,514	960	12,000	1,100	1382	17,000	1.4%
Tanzania	49,253,126	173	85,000	6,000	164	81,000	6.5%
Zambia	14,314,515	342	49,000	3,600	419	60,000	4.9%
Zimbabwe	13,327,925	435	58,000	5,700	585	78,000	6.3%
SADC totals	***292,763,840***	***457***	***1,337,424***	***128,516***	***422***	***1,236,688***	***100.0%***

Source: WHO Global TB report 2014 (population figures adapted to UN 2013 as in WHO Malaria report 2014)

Table 3 - Estimated number of MDR-TB patients in SADC (2013)

Country	New MDR-TB %	Estimated new MDR-TB cases	Retreatment MDR-TB %	Estimated retreatment MDR-TB cases	Total estimated MDR-TB cases
Angola	1.9	920	20	1500	2420
Botswana	2.5	120	6.6	69	189
DRC	2.6	2200	13	900	3100
Lesotho	0.9	68	5.7	92	160
Madagascar	0.5	99	3.9	94	193
Malawi	0.4	51	4.8	110	161
Mauritius	0	0	0	0	0
Mozambique	3.5	1500	11	830	2330
Namibia	3.8	250	16	360	610
Seychelles	0	0	0	0	0
South Africa	1.8	4600	6.7	2200	6800
Swaziland	7.7	390	34	250	640
Tanzania	1.1	530	3.1	86	616
Zambia	0.3	88	8.1	570	658
Zimbabwe	1.9	520	8.3	300	820
SADC total 2013		**11,336**		**7,361**	**18,697**
On treatment (SADC 2013 annual TB report)					**12,825**
Percentage treated					69%

Source: WHO Global TB report 2014

4. NUMBER OF MALARIA CASES PER SADC COUNTRY

Twelve SADC Member States have endemic malaria, although transmission levels vary widely. WHO estimates that 75% of people who reside in SADC are at risk of malaria. This includes 35 million children and 8.5 million pregnant women[3]. Annual malaria reports present overviews of the malaria situation and elimination efforts in SADC.[4]

SADC identified six countries as having the greatest potential to eliminate malaria by 2015 - Botswana, Namibia, South Africa and Swaziland, as well as the island states of Zanzibar and Madagascar. The concept of Malaria Elimination 8 (E8) brings together the four mainland countries (Botswana, Namibia, South Africa and Swaziland): these four are considered as the front-line countries in a Southern African malaria elimination approach. Their neighbours to the North with relatively higher transmission of malaria - Angola, Mozambique, Zambia and Zimbabwe - constitute the second-line countries of the Malaria Elimination 8 (E8).[5]

Table 4 - Malaria cases in SADC (2013)

Country/area	Population (UN)	At risk (low + high)	Suspected malaria cases	Presumed and confirmed cases
Angola (E8)	21,471,618	21,471,618	5,273,305	3,144,100
Botswana (E8)	2,021,144	1,313,744	506	506
DRC	67,513,677	67,513,677	14,871,716	11,363,817
Lesotho	2,074,465	0	N/A	N/A
Madagascar	22,924,851	22,924,851	2,142,620	387,045
Malawi	16,362,567	16,362,567	5,787,441	3,906,838
Mauritius	1,244,403	0	N/A	N/A
Mozambique (E8)	25,833,752	25,833,752	8,200,849	3,924,832
Namibia (E8)	2,303,315	1,658,387	188,004	4,911
Seychelles	92,838	0	N/A	N/A
South Africa (E8)	52,776,130	5,277,613	603,932	8,851
Swaziland (E8)	1,249,514	349,864	669	669
Tanzania	49,253,126	49,253,126	14,650,226	8,585,482
Zambia (E8)	14,314,515	14,314,515	5,465,122	5,465,122
Zimbabwe (E8)	13,327,925	6,663,963	1,115,005	422,633
SADC total	***292,763,840***	***232,937,676***	***58,299,395***	***37,214,806***

Source: WHO World Malaria report 2014, Annex 6a

[3] SADC situational analysis on Malaria in the SADC region, 2012. http://www.sadc.int/files/9514/1171/9272/Situation_and_Response_AnalysisReport_on_Malaria_in_the_SADC_Region.pdf

[4] SADC. Document available at http://www.sadc.int/documents-publications/show/2968

[5] SADC. Document available at https://tis.sadc.int/english/sarn/elimination-eight-e8/

4.1 Recommendations concerning regional production for Malaria6

The fight against malaria has achieved good results for some years, but the target to eradicate this disease will only be attained after many years. The fight against malaria is at different levels and we analyse here only those that concern local production in SADC.

Prevention and vector control:

1. LLIN: Impregnated bed nets will continue to be the basis for the control of transmission. SADC already has a local producer of LLIN in Tanzania to which a preference could easily be given in the different countries. It could be interesting to study how to cover all needs either by increasing the capacity of the existing plant or to build a new plant in another SADC country. Local production of adequate insecticides could also be analysed.
2. Internal Residual Spraying (IRS) in houses is based on DDT which is banned for other (agricultural) applications. The risk in coming years is the end of production as environmental problems have already led some producers to stop. Ethiopia and China have stopped producing, and the Indian producer HLL was obliged to close one of its three units.

Identification of the disease:

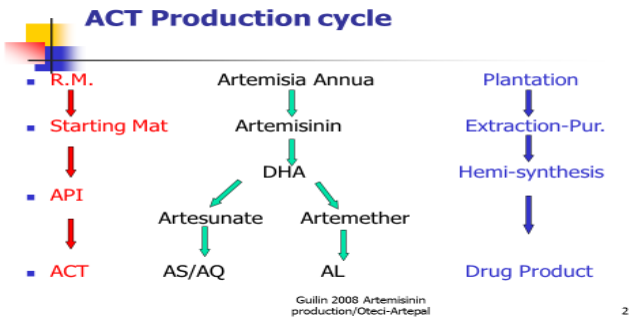
3. Rapid Diagnostic Tests (RDTs): Numerous RDTs exists and a more global approach is necessary to validate some of them and have them available in different countries. This will help in training people to use them and to standardize the analytical procedures. It would also help to have a local production of these RDTs in SADC.

Treatments:

4. For uncomplicated malaria cases, the use of ACTs remains the normal treatment.

The production cycle for ACTs is as follows:

Figure 2 – Production cycle for ACTs



The raw material are the dried leaves of *Artemisia annua*. After extraction-purification, the Artemisinin is the starting material. As such the specifications can be different according to suppliers but users to produce APIs will have to proof that their production process of APIs will deliver API with the requested quality.

[6] Contribution by artemisinin expert Mr Jacques Pilloy

The first chemical step after Artemisinin is DHA (dihydroartemisinin) which is common to all derivatives. If DHA is used as an API (in DHA/PPQ for example), it needs more purification (recrystallization usually) to respect specifications for an API. DHA is then transformed by specifics processes either in artesunate or artemether which are the main APIs for production of the different ACTs (AL: Artemether-lumefantrine, AS/AQ: artesunate-amodiaquine).

SADC has a producer of natural Artemisinin (Bionexx in Madagascar) which is an important player in the market with a good level of quality and process efficiency making it competitive with Chinese and Vietnamese producers. This is also based on the low cost of Artemisia annua in Madagascar. Expansion of cultivation in other countries seems difficult with the current level of the Artemisinin market as producers in Kenya and Uganda did stop recently as being no more competitive. Prices for Artemisinin in the open market are highly fluctuating. The present level is so low that we can fear farmers will not plant Artemisia for next season in Asia.

Normally, production of semi-synthetic artemisinin (SSA) in Italy by Sanofi is to help avoid shortages, but as market prices for the moment are far below production cost of SSA, Sanofi does not produce and does not sell SSA on the market. Even worse, few customers have validated SSA in their formulations, which could take a long time.

There are numerous producers of ACTs in SADC, none of them is qualified by WHO or a stringent regulatory authority, but only at national or at best regional level. As the different countries have defined different first line type of ACTs, this is a difficulty to improve quantities. A recommendation to validate different ACTs both as first line and second line, would facilitate exchanges and also prevent the appearance of resistance.

For severe malaria cases, **quinine** is still used but recommendations from WHO changed to **injectable artesunate or artemether**. There seems no need to increase the production of quinine. For the moment, quinine is still the reference treatment in several countries, but this will have to change to benefit from (subsidized?) injectable artesunate.

For severe cases, **rectal artesunate** seems very interesting: easy to use, low cost, and usable in villages by low-trained health workers. Although some products are available on the market, no one is WHO pre-qualified for the moment. A development funded by Unitaid is underway with an agreement between Malaria Medicines Venture (MMV), Cipla and Strides Arcolab to allow a submission to WHO PQ in 2016. Discussions could start with these organisations to obtain a licence to produce locally as soon as possible.

5. INVENTORY OF MEDICINES AND MANUFACTURERS

5.1 List of medicines produced in SADC for the 3 diseases

Table 5 - List of medicines produced in SADC for the 3 diseases

Disease	Product	Manufacturer	WHO Pre-qualified	Country	National Registration
A	Abacavir	NRB Pharmaceuticals	No	Zambia	Planned
A	Abacavir	Aspen Pharmacare	No	South Africa	Yes
A	Atazanavir	Aspen Pharmacare	No	South Africa	Yes
A	Darunavir (as ethanolate), Film-coated tablets 600mg (for Janssen-Cilag Intl NV, Belgium)	Aspen Pharmacare	Yes	South Africa	Yes
A	Didanosine	NRB Pharmaceuticals	No	Zambia	Planned
A	Didanosine	Aspen Pharmacare	No	South Africa	Yes
A	Efavirenz	Aspen Pharmacare	No	South Africa	Yes
A	Efavirenz	NRB Pharmaceuticals	No	Zambia	Planned
A	Efavirenz 600 mg, emtricitabine 200 mg and tenofovir disoproxil fumarate 300 mg	Sonke / Ranbaxy	No	South Africa	Yes
A	Efavirenz 600 mg, emtricitabine 200 mg and tenofovir disoproxil fumarate 300 mg (Odimune)	Cipla Medpro	No	South Africa	Yes
A	Efavirenz 600 mg, emtricitabine 200 mg and tenofovir disoproxil fumarate 300 mg (Tribuss)	Aspen Pharmacare	No	South Africa	Yes
A	Efavirenz 600mg tablet	TPI	No	Tanzania	No
A	Emtricitabine	Aspen Pharmacare	No	South Africa	Yes
A	Emtricitabine + Tenofovir Tablets 200mg + 300mg, (for Gilead Sciences, Inc.)	Aspen Pharmacare	Yes	South Africa	Yes
A	Etravirine	Aspen Pharmacare	No	South Africa	Yes
A	Fosamprenavir	Aspen Pharmacare	No	South Africa	Yes
A	Indinavir 400mg (capsule)	Varichem	No	Zimbabwe	Yes

Disease	Product	Manufacturer	WHO Pre-qualified	Country	National Registration
A	Lamivudine	NRB Pharmaceuticals	No	Zambia	Planned
A	Lamivudine	Aspen Pharmacare	No	South Africa	Yes
A	Lamivudine + Zidovudine Tablets (Red) 150mg + 300mg (for ViiV Health)	Aspen Pharmacare	Yes	South Africa	Yes
A	Lamivudine + Zidovudine Tablets 150mg + 300mg	Aspen Pharmacare	Yes	South Africa	Yes
A	Lamivudine 150mg (tablet)	Varichem	No	Zimbabwe	Yes
A	Lamivudine 150mg tablet	TPI	No	Tanzania	Yes
A	Lamivudine 150mg/Zidovudine 300mg (tablet)	Varichem	Previously	Zimbabwe	Yes
A	Lamivudine 150mg/Zidovudine 300mg/Nevirapine 200mg (tablet)	Varichem	No	Zimbabwe	Yes
A	Lamivudine Tablets (Red) 150mg (for ViiV HealthCare)	Aspen Pharmacare	Yes	South Africa	Yes
A	Lamivudine Tablets 150mg	Aspen Pharmacare	Yes	South Africa	Yes
A	Lopinavir / Ritonavir	NRB Pharmaceuticals	No	Zambia	Planned
A	Male latex condoms	Gemi Rubber	No	Botswana	Yes
A	Maraviroc	Aspen Pharmacare	No	South Africa	Yes
A	Nevirapine	Aspen Pharmacare	No	South Africa	Yes
A	Nevirapine + [Lamivudine + Zidovudine]Tablets 200mg + Tablets [150mg + 300mg]	Aspen Pharmacare	Yes	South Africa	Yes
A	Nevirapine 200mg (tablet)	Varichem	No	Zimbabwe	Yes
A	Rilpivirine	Aspen Pharmacare	No	South Africa	Yes
A	Ritonavir	NRB Pharmaceuticals	No	Zambia	Planned
A	Stavudine	Aspen Pharmacare	No	South Africa	Yes
A	Stavudine / Lamivudine / Nevirapine	NRB Pharmaceuticals	No	Zambia	Planned
A	Stavudine 30mg (capsule)	Varichem	No	Zimbabwe	Yes
A	Stavudine 30mg/Lamivudine 150mg/Nevirapine 200mg	Varichem	Previously	Zimbabwe	Yes
A	Tenofovir disoproxil	Aspen Pharmacare	No	South Africa	Yes
A	Tenofovir Tablets 300mg (for Gilead Sciences, Inc.)	Aspen Pharmacare	Yes	South Africa	Yes
A	various	Strides	No	Botswana	Planned

Disease	Product	Manufacturer	WHO Pre-qualified	Country	National Registration
A	Zidovudine	NRB Pharmaceuticals	No	Zambia	Planned
A	Zidovudine	Aspen Pharmacare	No	South Africa	Yes
A	Zidovudine 300 + Lamivudine 150mg (Zidolavir) tablet	TPI	No	Tanzania	Yes
A	Zidovudine 300mg (tablet)	Varichem	No	Zimbabwe	Yes
M	Amodiaquine	Zenufa	No	Tanzania	No
M	Artemether 180 mg/60ml + Lumefantrine 1080mg/60ml	Zenufa	No	DRC	Yes
M	Artemether 20 mg + Lumefantrine 120 mg	Zenufa	No	DRC	Yes
M	Artemether / Lumefantrine	NRB Pharmaceuticals	No	Zambia	Planned
M	Artesunate / amodiaquine tablet	Zenufa	No	Tanzania	No
M	Artesunate 100mg + Sulfamethoxypyrazine 250mg + Pyrimethamine 12,5mg	Zenufa	No	DRC	Yes
M	Artesunate200mg + Sulfamethoxypyrazine 500mg + Pyrimethamine25mg	Zenufa	No	DRC	Yes
M	Chloroquine (Plasmoquine)	MedChem	No	South Africa	Yes
M	Dihydroartemisinine20mg +Phosphate de Piperaquine 160 mg	Zenufa	No	DRC	Yes
M	Dihydroartemisinine 40 mg +Piperaquine 320 mg	Zenufa	No	DRC	Yes
M	LLIN	A to Z Mills	Yes	Tanzania	Yes
M	Quinine 300mg	Fresenius	No	South Africa	Yes
M	Quinine Chlorhydrate (API)	Pharmakina	No	DRC	Yes
M	Quinine Dichlorhydrate (API)	Pharmakina	No	DRC	Yes
M	Quinine Dihydrochloride 100mg/5ml syrup 100ml	Zenufa	No	DRC	Yes
M	Quinine Dihydrochloride drops 20%	Zenufa	No	DRC	Yes
M	Quinine Injectable	Pharmakina	No	DRC	Yes
M	Quinine Solution	Pharmakina	No	DRC	Yes
M	Quinine Sulphate (API)	Pharmakina	No	DRC	Yes
M	Quinine Sulphate (Tablets)	Pharmakina	No	DRC	Yes

Disease	Product	Manufacturer	WHO Pre-qualified	Country	National Registration
M	Quinine Sulphate 300mg tablets	SADM	No	Malawi	Yes
M	Quinine Sulphate tablets	Pharmanova	No	Malawi	Yes
M	Quinine Syrup	Pharmakina	No	DRC	Yes
M	Quinine syrup	Zenufa	No	Tanzania	Yes
M	Sulfadoxine + pyrimethamine 525mg (Paludar)	Zenufa	No	DRC	Yes
M	Sulfadoxine + pyrimethamine tablet	Zenufa	No	Tanzania	Yes
M	Sulfadoxine + pyrimethamine 500 / 25mg tablets	Pharmanova	No	Zambia	Yes
M	Sulfadoxine + pyrimethamine 500 / 25mg tablets + artesunate 100mg in co-pack	Pharmanova	No	Zambia	Yes
M	Sulfadoxine + Pyrimethamine 525mg tablets	SADM	No	Malawi	Yes
M	Sulfadoxine + Pyrimethamine 525mg tablets	Pharmanova	No	Malawi	Yes
T	Amikacin 250mg/500mg	Fresenius	No	South Africa	Yes
T	Capreomycin	Aspen Pharmacare	No	South Africa	Yes
T	Cycloserine	Aspen Pharmacare	Yes	South Africa	Yes
T	Ethambutol	Sanofi	No	South Africa	Yes
T	Ethionamide 250 mg (Ethatyl)	Sanofi	No	South Africa	Yes
T	Isoniazid	Sanofi	No	South Africa	Yes
T	Isoniazid 300mg	Sanofi	No	South Africa	Yes
T	Pyrazinamide 500mg (Pyrazide)	Sanofi	No	South Africa	Yes
T	Pyrazinamide 500mg tablets	SADM	No	Malawi	Yes
T	Rifampicin (Rifadin) 150mg	Sanofi	No	South Africa	Yes
T	Rifampicin (Rifadin) 300mg	Sanofi	No	South Africa	Yes
T	Rifampicin 150 mg + isoniazid 75 mg (Rifinah 150/75)	Sanofi	No	South Africa	Yes
T	Rifampicin 150 mg + Isoniazid 75 mg + Pyrazinamide 400 mg + Ethambutol 275 mg (Rifafour e275)	Sanofi	No	South Africa	Yes
T	Rifampicin 300 mg + isoniazid 150 mg (Rifinah 300/150)	Sanofi	No	South Africa	Yes
T	Terizidone 250mg (Terivalidin)	Sanofi	No	South Africa	Yes

5.2 List of manufacturers in SADC for the 3 diseases

Table 6 - List of manufacturers in SADC for the 3 diseases

Manufacturer	Country	Product	WHO Pre-qualified	National Registration	Disease
A to Z Mills	Tanzania	LLIN	Yes	Yes	M
Aspen Pharmacare	South Africa	Abacavir	No	Yes	A
Aspen Pharmacare	South Africa	Atazanavir	No	Yes	A
Aspen Pharmacare	South Africa	Darunavir (as ethanolate), Film-coated tablets 600mg (for Janssen-Cilag Intl NV, Belgium)	Yes	Yes	A
Aspen Pharmacare	South Africa	Didanosine	No	Yes	A
Aspen Pharmacare	South Africa	Efavirenz	No	Yes	A
Aspen Pharmacare	South Africa	Efavirenz 600 mg, emtricitabine 200 mg and tenofovir disoproxil fumarate 300 mg (Tribuss)	No	Yes	A
Aspen Pharmacare	South Africa	Emtricitabine	No	Yes	A
Aspen Pharmacare	South Africa	Emtricitabine + Tenofovir Tablets 200mg + 300mg, (for Gilead Sciences, Inc.)	Yes	Yes	A
Aspen Pharmacare	South Africa	Etravirine	No	Yes	A
Aspen Pharmacare	South Africa	Fosamprenavir	No	Yes	A
Aspen Pharmacare	South Africa	Lamivudine	No	Yes	A
Aspen Pharmacare	South Africa	Lamivudine + Zidovudine Tablets (Red) 150mg + 300mg (for ViiV Health)	Yes	Yes	A
Aspen Pharmacare	South Africa	Lamivudine + Zidovudine Tablets 150mg + 300mg	Yes	Yes	A
Aspen Pharmacare	South Africa	Lamivudine Tablets (Red) 150mg (for ViiV HealthCare)	Yes	Yes	A
Aspen Pharmacare	South Africa	Lamivudine Tablets 150mg	Yes	Yes	A
Aspen Pharmacare	South Africa	Maraviroc	No	Yes	A
Aspen Pharmacare	South Africa	Nevirapine	No	Yes	A
Aspen Pharmacare	South Africa	Nevirapine + [Lamivudine + Zidovudine]Tablets 200mg + Tablets [150mg + 300mg]	Yes	Yes	A
Aspen Pharmacare	South Africa	Rilpivirine	No	Yes	A

Manufacturer	Country	Product	WHO Pre-qualified	National Registration	Disease
Aspen Pharmacare	South Africa	Stavudine	No	Yes	A
Aspen Pharmacare	South Africa	Tenofovir disoproxil	No	Yes	A
Aspen Pharmacare	South Africa	Tenofovir Tablets 300mg (for Gilead Sciences, Inc.)	Yes	Yes	A
Aspen Pharmacare	South Africa	Zidovudine	No	Yes	A
Aspen Pharmacare	South Africa	Capreomycin	No	Yes	T
Aspen Pharmacare	South Africa	Cycloserine	Yes	Yes	T
Cipla Medpro	South Africa	Efavirenz 600 mg, emtricitabine 200 mg and tenofovir disoproxil fumarate 300 mg (Odimune)	No	Yes	A
Fresenius	South Africa	Quinine 300mg	No	Yes	M
Fresenius	South Africa	Amikacin 250mg/500mg	No	Yes	T
Gemi Rubber	Botswana	Male latex condoms	No	Yes	A
MedChem	South Africa	Chloroquine (Plasmoquine)	No	Yes	M
NRB Pharmaceuticals	Zambia	Abacavir	No	Planned	A
NRB Pharmaceuticals	Zambia	Didanosine	No	Planned	A
NRB Pharmaceuticals	Zambia	Efavirenz	No	Planned	A
NRB Pharmaceuticals	Zambia	Lamivudine	No	Planned	A
NRB Pharmaceuticals	Zambia	Lopinavir / Ritonavir	No	Planned	A
NRB Pharmaceuticals	Zambia	Ritonavir	No	Planned	A
NRB Pharmaceuticals	Zambia	Stavudine / Lamivudine / Nevirapine	No	Planned	A
NRB Pharmaceuticals	Zambia	Zidovudine	No	Planned	A
NRB Pharmaceuticals	Zambia	Artemether / Lumefantrine	No	Planned	M
Pharmakina	DRC	Quinine Chlorhydrate (API)	No	Yes	M
Pharmakina	DRC	Quinine Dichlorhydrate (API)	No	Yes	M
Pharmakina	DRC	Quinine Injectable	No	Yes	M
Pharmakina	DRC	Quinine Solution	No	Yes	M
Pharmakina	DRC	Quinine Sulphate (API)	No	Yes	M
Pharmakina	DRC	Quinine Sulphate (Tablets)	No	Yes	M

Manufacturer	Country	Product	WHO Pre-qualified	National Registration	Disease
Pharmakina	DRC	Quinine Syrup	No	Yes	M
Pharmanova	Malawi	Quinine Sulphate tablets	No	Yes	M
Pharmanova	Malawi	Sulfadoxine + pyrimethamine 525mg tablets	No	Yes	M
Pharmanova	Zambia	Sulfadoxine + pyrimethamine 500 / 25mg tablets	No	Yes	M
Pharmanova	Zambia	Sulfadoxine + pyrimethamine 500 / 25mg tablets + artesunate 100mg in co-pack	No	Yes	M
SADM	Malawi	Quinine Sulphate 300mg tablets	No	Yes	M
SADM	Malawi	Sulfadoxine + pyrimethamine 525mg tablets	No	Yes	M
SADM	Malawi	Pyrazinamide 500mg tablets	No	Yes	T
Sanofi	South Africa	Ethambutol	No	Yes	T
Sanofi	South Africa	Ethionamide 250 mg (Ethatyl)	No	Yes	T
Sanofi	South Africa	Isoniazid	No	Yes	T
Sanofi	South Africa	Isoniazid 300mg	No	Yes	T
Sanofi	South Africa	Pyrazinamide 500mg (Pyrazide)	No	Yes	T
Sanofi	South Africa	Rifampicin (Rifadin) 150mg	No	Yes	T
Sanofi	South Africa	Rifampicin (Rifadin) 300mg	No	Yes	T
Sanofi	South Africa	Rifampicin 150 mg + isoniazid 75 mg (Rifinah 150/75)	No	Yes	T
Sanofi	South Africa	Rifampicin 150 mg + Isoniazid 75 mg + Pyrazinamide 400 mg + Ethambutol 275 mg (Rifafour e275)	No	Yes	T
Sanofi	South Africa	Rifampicin 300 mg + isoniazid 150 mg (Rifinah 300/150)	No	Yes	T
Sanofi	South Africa	Terizidone 250mg (Terivalidin)	No	Yes	T
Sonke / Ranbaxy	South Africa	Efavirenz 600 mg, emtricitabine 200 mg and tenofovir disoproxil fumarate 300 mg	No	Yes	A
Strides	Botswana	various	No	Planned	A
TPI	Tanzania	Efavirenz 600mg tablet	No	No	A
TPI	Tanzania	Lamivudine 150mg tablet	No	Yes	A
TPI	Tanzania	Zidovudine 300 + Lamivudine 150mg (Zidolavir) tablet	No	Yes	A
Varichem	Zimbabwe	Indinavir 400mg (capsule)	No	Yes	A

Manufacturer	Country	Product	WHO Pre-qualified	National Registration	Disease
Varichem	Zimbabwe	Lamivudine 150mg (tablet)	No	Yes	A
Varichem	Zimbabwe	Lamivudine 150mg/Zidovudine 300mg/Nevirapine 200mg (tablet)	No	Yes	A
Varichem	Zimbabwe	Nevirapine 200mg (tablet)	No	Yes	A
Varichem	Zimbabwe	Stavudine 30mg (capsule)	No	Yes	A
Varichem	Zimbabwe	Stavudine 30mg/Lamivudine 150mg/Nevirapine 200mg	Previously	Yes	A
Varichem	Zimbabwe	Zidovudine 300mg (tablet)	No	Yes	A
Zenufa	DRC	Artemether 180 mg/60ml + Lumefantrine 1080mg/60ml	No	Yes	M
Zenufa	DRC	Artemether 20 mg + Lumefantrine 120 mg	No	Yes	M
Zenufa	DRC	Artesunate 100mg + Sulfamethoxypyrazine 250mg + Pyrimethamine 12,5g	No	Yes	M
Zenufa	DRC	Artesunate200mg + Sulfamethoxypyrazine 500mg + Pyrimethamine25mg	No	Yes	M
Zenufa	DRC	Dihydroartemisinine20mg +Phosphate de Piperaquine 160 mg	No	Yes	M
Zenufa	DRC	Piperaquine 320 mg + Dihydroartemisinine 40 mg	No	Yes	M
Zenufa	DRC	Quinine Dihydrochloride 100mg/5ml syrup 100ml	No	Yes	M
Zenufa	DRC	Quinine Dihydrochloride drops 20%	No	Yes	M
Zenufa	DRC	Sulfadoxin + Pyrimethamine 525mg (Paludar)	No	Yes	M
Zenufa	Tanzania	Amodiaquine	No	No	M
Zenufa	Tanzania	Artesunate / amodiaquine tablet	No	No	M
Zenufa	Tanzania	Quinine syrup	No	Yes	M
Zenufa	Tanzania	Sulfadoxin + Pyrimethamine tablet	No	Yes	M

5.3 List of WHO prequalified medicines in SADC

Table 7 - List of WHO prequalified medicines in SADC

Product	Dosage form	Company	Plant location	Packaging	PQ nr
Tenofovir	Tablets 300mg	Gilead Sciences, Inc.	Aspen Pharmacare, OSD Facility Korsten, Port Elizabeth, South Africa	HDPE bottle 30	HA329 (a)
Darunavir (as ethanolate)	Film-coated tablets 600mg	Janssen-Cilag International NV, Belgium	Pharmacare Limited, Korsten, Port Elizabeth, South Africa (QC release)	DPE bottle 60	HA531
Emtricitabine + Tenofovir	Tablets 200mg + 300mg	Gilead Sciences, Inc.	Aspen Pharmacare, OSD Facility, Korsten, Port Elizabeth, South Africa	PE bottle 30	HA343 (a)
Lamivudine	Tablets 150mg	Aspen Port Elizabeth (Pty) Ltd	Port Elizabeth, South Africa	Metallised lay flat pack, PP bottle 60	HA282
Lamivudine	Tablets (Red) 150mg	ViiV HealthCare	Aspen Pharmacare Ltd, Port Elizabeth, South Africa;	HDPE bottle 60	EMEA Art 58
Lamivudine + Zidovudine	Tablets 150mg + 300mg	Pharmacare Limited	Korsten, Port Elizabeth, South Africa	PVC/PE/PVDC/Alu blister 10; Carton 60	USFDA
Lamivudine + Zidovudine	Tablets (Red) 150mg + 300mg	ViiV Health	Aspen Pharmacare Ltd, Port Elizabeth, South Africa;	HDPE bottle 60	EMEA Art 58
Nevirapine + [Lamivudine + Zidovudine]	Tablets 200mg + Tablets [150mg + 300mg]	Aspen Pharmacare	Port Elizabeth, South Africa	Blister 6+6	USFDA[2]

South Africa also produces other ARVs in factories that are MCC approved but not WHO prequalified:

1. Sonke Pharmaceuticals lists 16 ARVs on http://www.sonkepharmaceuticals.co.za/; has launched 21 products to date, eight of which are manufactured locally in South Africa. Sonke Pharmaceuticals is a Black Economic Empowerment joint venture between Ranbaxy (Pty) Ltd and Community Investment Holdings. The company was contracted to supply 30% of the main first-line generic FDC (tenofovir, emtricitabine and efavirenz) in the South African government tender for ARVs 2015-2018.
2. Cipla-Medpro: Cipla Medpro South Africa Ltd., the country's third-biggest pharmaceutical manufacturer. Was contracted to supply 18% of the main first-line generic FDC (tenofovir, emtricitabine and efavirenz) in the South African government tender for ARVs 2015-2018. The product will be manufactured

at a plant in Kwazulu-Natal province under a contract that starts on April 1, 2015. http://www.bloomberg.com/news/articles/2014-12-23/cipla-medpro-wins-173-million-south-africa-drug-contract

3. Adcock Ingram (Wadesville; GMP approved by: FDA 2013, South Africa (MCC), Ghana (FDB), Botswana (DRU), Malawi (PMPB) and PIC/S),

The following companies supply ARVs to the SA Government, but the products are manufactured outside South Africa:

4. Aurobindo PHARMA (PTY) LTD. Woodhill Office Park. Sells EFV, DDI, STA, ABA, LMV (manufactured in India)
5. Mylan Pharmaceuticals, Modderfontein. Contracted to supply 28% of the main first-line generic FDC (tenofovir, emtricitabine and efavirenz) in the South African government tender for ARVs 2015-2018. Imported into SA from USA or India.

In Mozambique the state owned company Sociedade Moçambicana de Medicamentos has received support from Brazil to set up ARV production, but the production of ARVs has not yet started. The factory is designed for the technique of direct compression (probably Lamivudine / Zidovudine / Nevirapine); for the production of Tenofovir based regimens the technique of wet granulation is required[7].

Indian manufacturer Strides plans to build a GMP compliant manufacturing facility in Mozambique (Strides Pharma Mozambique SA) and packaging facilities in Botswana and Namibia[8]. There are conflicting reports whether ARVs will be produced in these plants.

In Botswana, Strides is starting up an ARV repackaging factory at the Selokwana Industrial Site, Tlokweng, Gaborone 403718, Botswana[9].
In DRC, PharmaKina (quinine manufacturer in Bukavu) developed a production line for ARVs in 2007 (with German and Thai assistance) but they did not have the budget to go for WHO prequalification (then estimated at 300,000 USD – including funds for bio-equivalence studies). Production ceased in 2008.
In Tanzania, TPI Arusha had an ARV project with €5m EU support; German Action Medeor provided technical assistance[10]. "Pharm R&D Lab" set up; current status of production unclear.
In Zambia, Pharco Ltd. developed a few test batches of ARVs at Medical Stores Ltd in 2004, but production never scaled up. NRB Pharmaceuticals, a new manufacturer in the Special Economic Zone, plans to make ARVs.

[7] **hera** national consultant report, May 2015.
[8] http://www.stridesarco.com/pdf/africa_locations.pdf
[9] http://www.stridesarco.com/pdf/africa_locations.pdf
[10] http://en.medeor.de/de/hilfsprojekte/pharmazeutische-fachberatung/lokale-medikamentenproduktion.html

5.4 Medicines and related supplies used in SADC for the 3 diseases

Table 8 - Medicines and related supplies used in SADC for the 3 diseases

Category	Product	Description (example/strength)	Level	WHO EML	Comments
Bednet	Insecticide-treated net (ITN)	Rectangular	1		
Bednet	Interceptor	Rectangular	1		WHOPES approved
Bednet	LifeNet	Conical	1		WHOPES approved
Bednet	Long-Lasting Insecticidal Net (LLIN)	Rectangular	1		
Bednet	MAGNet	Rectangular	1		
Bednet	Netprotect	Conical	1		
Bednet	Olyset	Rectangular	1		WHOPES approved
Bednet	Permanet 2.0	Rectangular	1		
Bednet	Royal Sentry	Rectangular	1		
Bednet	Yorkool LN	Rectangular	1		
Condom	Female Condom	Female Condom	1	Yes	
Condom	Male Latex Condom	Male Latex Condom	1	Yes	
Diagnostic	HIV CD4 testing consumables/test kits	BD FACSCount Reagent Kit for 50 tests [340167]			
Diagnostic	HIV CD4 testing equipment	PIMA Analyser [260300001]			
Diagnostic	HIV RDT and EIA	Alere DetermineHIV-1/2Serum/Plasma Assay-100s [7D2343]			
Diagnostic	HIV virological testing consumables/test kits	NucliSENS EasyQ HIV-1 V2.0 test kit [285033]			
Diagnostic	Malaria Rapid Diagnostic Test	Malaria RDT			
Diagnostic	Malaria RDT	Paracheck Pf Device-Rapid test for P. Falciparum Malaria Ver.3 Cassette [30301025]			
Diagnostic	Malaria RDT: P.f./P.v	SD Bioline Malaria Ag Pf/Pv [05FK80]			
Diagnostic	Malaria RDT: P.f/Pan	SD Bioline Malaria Ag Pf/Pan [05FK66]			

Category	Product	Description (example/strength)	Level	WHO EML	Comments
Diagnostic	TB molecular diagnostics	Cepheid GeneXpert Model GX-IV- 4 module Instrument with desktop [GXIV-4D]			
Diagnostic	TB testing consumables/test kits	BACTEC MGIT 960 PZA Drug Kit 50s [245128]			
HIV	Abacavir (ABC)	300mg | tab	2	Yes	
HIV	Abacavir + Lamivudine - FDC	600mg+300mg | tab	2	Yes	
HIV	Abacavir + Lamivudine + Zidovudine - FDC	300mg+150mg+300mg | tab	2		
HIV	Atazanavir (ATV)	150mg | capsule	2	Yes	
HIV	Atazanavir + Ritonavir - FDC	300mg+100mg | tab	2		
HIV	Cobicistat		2		Experimental booster
HIV	Darunavir (TCM)	300mg | tab	3	Yes	
HIV	Didanosine (ddI)	125mg | capsule delayed release	1		
HIV	Dolutegravir		2		New
HIV	Dolutegravir + abacavir + lamivudine (DTG/ABC/3TC)	Dispersible (paediatric) tablet	2		New
HIV	Efavirenz (EFV)	600mg | tab	1	Yes	
HIV	Efavirenz + [Lamivudine + Zidovudine] - Co-blister	600mg+[150mg+300mg] - 1+2 | tab	1		
HIV	Efavirenz + Emtricitabine + Tenofovir - FDC	600mg+200mg+300mg | tab	1	Yes	
HIV	Efavirenz + Lamivudine + Tenofovir - FDC	600mg+300mg+300mg | tab	1		
HIV	Emtricitabine + Tenofovir - FDC	200mg+300mg | tab	1	Yes	
HIV	Etravirine (ETV)		3		
HIV	Indinavir (IDV)	150mg+200mg+300mg | tab	2		
HIV	Lamivudine (3TC)	150mg | tab	1	Yes	
HIV	Lamivudine + Nevirapine + Stavudine - FDC	150mg+200mg+30mg | tab	1	Yes	
HIV	Lamivudine + Nevirapine + Zidovudine - FDC	150mg+200mg+300mg | tab	1	Yes	
HIV	Lamivudine + Stavudine - FDC	150mg+30mg | tab	1		
HIV	Lamivudine + Tenofovir - FDC	300mg+300mg | tab	1		
HIV	Lamivudine + Tenofovir] + Nevirapine - Co-blister	[300mg+300mg] + 200mg - 1+2 | tab	1		

Category	Product	Description (example/strength)	Level	WHO EML	Comments
HIV	Lamivudine + Zidovudine - FDC	30mg+60mg | dispersible tab	1	Yes	
HIV	Lamivudine + Zidovudine] + Nevirapine - Co-blister	[150mg+300mg] + 200mg - 1+1 | tab	1		
HIV	Lopinavir/ritonavir pellets	pellets	1	Yes	New paediatric dosage form
HIV	Lopinavir + Ritonavir - FDC	100mg+25mg | tab	1	Yes	For children <36m
HIV	Nevirapine (NVP)	200mg | tab	1	Yes	
HIV	Raltegravir	400mg | tab	3		
HIV	Ritonavir (RTV)	100mg | tab	1	Yes	
HIV	Saquinavir (SQV)	500mg | tab	2	Yes	
HIV	Stavudine (d4T)	20mg | capsule	1	Yes	
HIV	Tenofovir (TDF)	300mg | tab	1	Yes	
HIV	Tenofovir alafenamide fumarate (TAF)				Experimental
HIV	Zidovudine (AZT or ZDV)	10mg/ml | oral liquid	1	Yes	
Insecticide	IRS-Bendiocarb-WP	0.8			
Insecticide	IRS-Deltamethrin-WG	25% or 250gms/kg			
Insecticide	IRS-p,p' DDT-WP	75% or 750 g/kg			At risk
Malaria	Artemether + Lumefantrine - FDC	20mg+120mg - 12 | dispersible tab	1	Yes	
Malaria	Artesunate	60mg | powder for inj	2	Yes	Only injection
Malaria	Artesunate + Amodiaquine - Co-blister	50mg+153mg (base) - 12+12 | tab			Risk of not taking Amodiaquine
Malaria	Artesunate + Amodiaquine - FDC	100mg+270mg (base) - 3 | tab	1	Yes	
Malaria	Primaquine	7.5mg(as base)(equivalentto13.2mg) | tab		Yes	Special cases
Malaria	Quinine	300mg | tab	2	Yes	Old
Malaria	Sulfadoxine + Pyrimethamine - FDC	500mg+25mg | tab	1	Yes	IpT
TB	Amikacin	500mg/2ml | inj	3	Complementary	Old
TB	Bedaquiline	100mg tabs	3	Complementary	New
TB	Capreomycin	1g | powder for inj	3	Complementary	Old
TB	Cycloserine	250mg | capsule	3	Complementary	Old

Category	Product	Description (example/strength)	Level	WHO EML	Comments
TB	Delamanid	50mg tabs	3	Complementary	New
TB	Ethambutol	100mg | tab	1	Yes	Not alone
TB	Ethambutol + Isoniazid - FDC	400mg+150mg | tab	1	Yes	No longer recommended
TB	Ethambutol + Isoniazid + Pyrazinamide + Rifampicin (RHZE)- FDC	275mg+75mg+400mg+150mg | tab	1	Yes	
TB	Ethambutol + Isoniazid + Rifampicin - FDC	275mg+75mg+150mg | tab	1	Yes	
TB	Ethionamide	250mg | tab	1	Complementary	Not alone
TB	Isoniazid	100mg | tab	1	Yes	Not alone
TB	Isoniazid + Pyrazinamide + Rifampicin - FDC	30mg+150mg+60mg | dispersible tab	1	Yes	
TB	Isoniazid + Rifampicin - FDC	75mg+150mg | tab	1	Yes	
TB	Kanamycin	1g/4ml | inj	3	Complementary	Old
TB	Levofloxacin	250mg | tab	3	Complementary	New
TB	Linezolid	400mg tabs	3	Complementary	Old
TB	Moxifloxacin	400mg | tab	3	Alternative	New
TB	Ofloxacin	200mg | tab	3	Alternative	New
TB	PAS Sodium	4g | granules	3	Complementary	Old
TB	Pretomanid (PA-824)		3		Experimental
TB	Prothionamide	250mg | tab	3	Alternative	Old
TB	Pyrazinamide	500mg | tab	1	Yes	Not alone
TB	Rifabutin	150mg caps		Yes	For use in ART with protease inhibitors
TB	Rifampicin	150mg | tab	1	Yes	Not alone
TB	Rifapentine			Yes	For latent TB
TB	Streptomycin	1g | powder for inj	2	Yes	At risk
TB	Terizidone	250mg | tab	3	Alternative	Old
TB	Water for injection	5ml | inj		Yes	For streptomycin

Source: PQR database 2010-2014; WHO EML status as per 19th WHO Model List April 2015; WHOPES approval as per WHO list 14 May 2015.

6. INVENTORY EXPENDITURE FOR THE 3 DISEASES

6.1 Global Fund Price and Quality Reporting (PQR) database

The PQR expenditure for 5 years (2010-14) among the different categories of medicines and supplies is divided as follows:

Table 9 - PQR expenditure per category for 5 years (2010-14)

#	Product Group	Total costs, 5 years 2010-14 (USD)	% of Grand Total
1	ARVs	924,216,391	62%
2	BEDNETS	269,981,037	18%
3	DIAGN HIV	68,457,206	5%
4	DIAGN Mal	61,128,251	4%
5	MALARIA A/L	49,666,001	3%
6	MALARIA	42,344,481	3%
7	TB 1st line	27,252,153	2%
8	MALARIA A/A	18,924,079	1%
9	CONDOMS	16,984,055	1%
10	IRS	6,368,242	0.4%
11	FEM CONDOMS	5,404,725	0.4%
12	TB MDR	3,285,811	0.2%
13	OTHER	1,291,741	0.1%
	Grand Total	**1,495,504,051**	

Further analysis of the Global Fund data reveals that 66% of the value of the products relates to HIV and 30% to malaria, while TB and remaining costs account for 2.4 and 1.5% respectively.

Table 10 - SADC average expenditure per year in PQR

Disease group	PQR SADC average expenditure per year (USD)	Ratio
HIV	$198,574,695	66%
Malaria	$ 89,682,418	30%
TB	$ 6,107,593	2.4%
Other (including condoms)	$ 4,736,104	1.5%
Total	$299,100,810	100%

Procurement transactions costs 2010-2014 for 13 SADC countries on medicines and supplies for HIV, TB and Malaria[11]. (All figures in USD):

Table 11 - Procurement transactions costs 2010-2014 on medicines/supplies for HIV, TB & Malaria

SADC country	Total costs products PQR 2010-14 (USD)	Per capita costs per year (PQR)	Per capita health expenditure 2010[12]	Costs per year (PQR)/health expenditure
Angola	19,530,438	0.23	71	0.3%
Botswana	0	0	296	0%
DRC	179,121,136	0.54	11.8	4.6%
Lesotho	25,193,771	2.01	50.1	4.0%
Madagascar	35,146,442	0.32	22.1	1.4%
Malawi	237,783,320	3.42	21	16.3%
Mauritius	805,283	0.13	230	0.1%
Mozambique	116,624,008	1.14	19	6.0%
Namibia	34,067,047	3.11	252	1.2%
Seychelles	0	0	565	0%
South Africa	74,452,515	0.3	425	0.1%
Swaziland	13,326,374	2.62	155	1.7%
Tanzania	367,580,825	1.82	23	7.9%
Zambia	194,509,399	3.24	38	8.5%
Zimbabwe	197,363,493	3.23	38	8.5%

6.2 PEPFAR

USAID/PEPFAR has a transparent database of expenditures. The total expenditure listed for ARVs in 9 SADC Member States over the years 2012-2013 was USD 198,914,625:

Table 12 – PEPFAR expenditure (2012+2013)

Country	Expenditure in USD
Botswana	2,006,858
Lesotho	20,560
Malawi	15,341
Mozambique	40,290,680
Namibia	873,985
South Africa	37,469,451
Tanzania	41,580,328
Zambia	64,623,582
Zimbabwe	12,033,840
Total	198,914,625

[11] Global Fund Price-Quality-Report http://pqr.theglobalfund.org/ (accessed March 2015)

[12] SADC Situational Analysis on Pooled Procurement, SADC 2012

6.3 South African government tender

As South Africa has the biggest ART programme in SADC (2.7m people on ART, of which 1.5m are receiving the fixed dose regimen introduced in April 2013), its ARV tender is an important source of information.

In December 2014 the South African Department of Health announced that various pharmaceutical companies won contracts for the three-year tender worth over ZAR14bn (USD 1.2bn) to supply 17 different ARVs from 8 different manufacturers for the 3-year period April 2015 – March 2018. This is a procurement volume of on average USD 400m per year.

The contract for the main first-line generic FDC (tenofovir, emtricitabine and efavirenz) amounted to ZAR 10.2bn (USD 880 m), and was split between 4 companies: Sonke Pharmaceuticals (30%), Mylan Pharmaceuticals (28%), Aspen Pharmacare (24%) and Cipla Medpro (18%).

The SA Health Minister said that "The health department aims to have about 4.6m people on treatment by the end of 2016."

For TB, the total awarded amount for 2015-2018 was ZAR 990m (USD 84m) for 14 different TB medicines, to be procured from 10 companies: this is on average ZAR 330m or USD 28m per year.

7. REGIONAL CENTRES OF EXCELLENCE

Two relevant publications gave very good overviews of Centres of Excellence and training needed by manufacturers:

1. David Katere. Analysis of Training Needs in the Generic Medicines Sector in the South African Development Community – a study commissioned by SAGMA. UNIDO, May 2014
2. Prof Henry Fomundam. Identifying Training and Research Needs and Facilitating the Selection of Centres of Excellence and Centres of Specialisation in Pharmaceutical Training. SADC, August 2015

Consultants visited Wits University (South Africa) and Kilimanjaro School of Pharmacy (Tanzania).

South African and Tanzanian universities are the only ones offering short and online courses which personnel in the pharmaceutical industry can benefit from. The Medicines Control Authority of Zimbabwe (MCAZ) also offers relevant short courses in its laboratory. Short courses and online courses relevant to industrial pharmacy include those offered by North-West University (NWU) in Pharmaceutical Formulation, the Advanced Training Programme in Industrial Pharmacy offered by the Kilimanjaro School of Pharmacy (KSP) – St Luke's Foundation (SLF) and Pharmaceutics, Pharmaceutical Manufacturing and Analysis courses offered by the Muhimbili University of Health and Allied Sciences (MUHAS), both in Tanzania. The last two programmes were cited by the Pharmaceutical Manufacturing Plan for Africa (PMPA) as being strategic to capacity building and growth of local pharmaceutical production. Both are focused on industrial pharmacy and are aimed at persons already working in the industry.

The Kilimanjaro School of Pharmacy (KSP) – St Luke's Foundation (SLF) offers an advanced training programme in industrial pharmacy under its Industrial Pharmacy Teaching Unit (IPTU) in collaboration with Purdue University and Howard University, USA. The Industrial Pharmacy Advanced Training Program (IPAT) consists of four courses - Drug Development, Drug Manufacturing, Regulatory Affairs, and Quality Compliance.

The Pharmaceutical Research and Development Laboratory at Muhimbili University of Health and Allied Sciences (MUHAS) in Tanzania has some bench-top equipment for formulation development and offers short courses in qualification and validation in Pharmaceutical Manufacturing, Pharmaceutical Analysis (method development and validation), Pharmaceutics (fluid bed drying, granulating and coating, granulation and tableting), Quality Assurance and Quality Control.

In addition to the training institutions, professional associations organize ongoing training to keep industry updated. SAGMA (Southern African Generic Medicines Association), a SADC wide association promoting local production and provision of affordable quality generic medicines in the region'[13], conducts training courses twice a year on aspects of manufacturing operations that are needed by industry.

[13]SAGMA website - http://www.sagma.net

8. API MANUFACTURE USING FLOW TECHNOLOGY

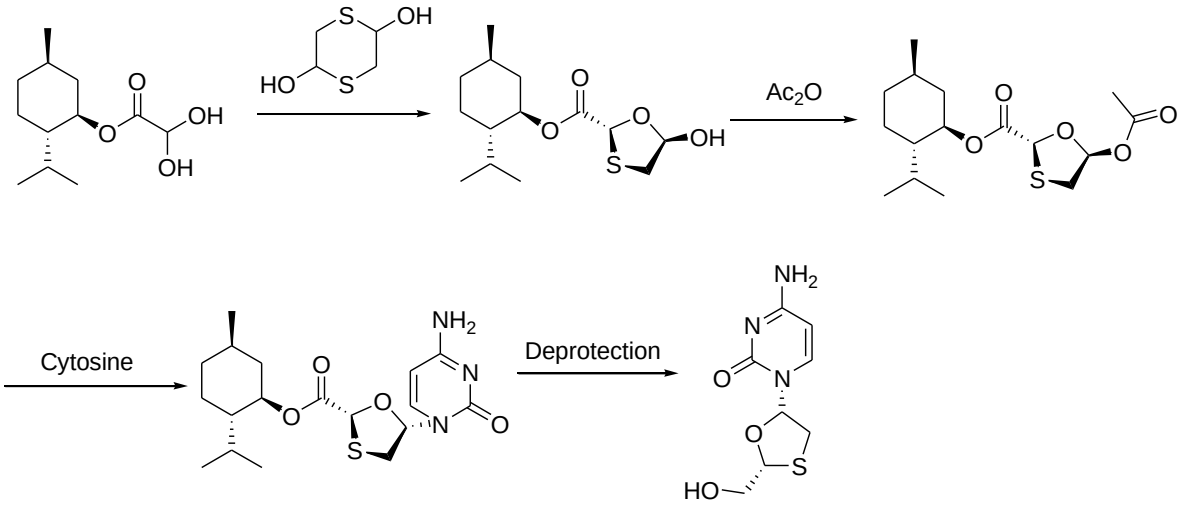
Active Pharmaceutical Ingredient Manufacture Using Flow Technology

Active Pharmaceutical Ingredients (APIs) are commonly produced in batch mode. Although this technology has the advantage of the multi-purpose utilisation of production equipment, continuous or flow-based chemistry has gained momentum as a realistic alternative in API processing. Both manufacturing modes are valid, but continuous flow processing offers the potential of improved manufacturing performance through higher efficiencies, better safety, easier process control and lower capital cost.

In particular, a SADC facility for the production of APIs as required for its public health programs in the treatment of HIV, TB and malaria, could achieve the necessary competitive advantage if it were to adopt flow-based technology as the production approach. The market for generic APIs covering the treatment of these three diseases is highly competitive with the Indian and Chinese producers having a virtual monopoly on the global supply. A SADC facility could leapfrog the existing producers if it were to successfully adopt continuous flow chemistry. Such processes provide not only a much smaller foot print with regard to the production equipment and subsequent plant size, but also better process control as well as a smaller environmental footprint. Another important advantage of this approach is its flexibility to allow process development at production scale, thereby circumventing frequent process control issues encountered when scaling up conventional batch reactor processes. Rapid process optimization including possible in situ generation of intermediates in the reactor as well as safer processing of hazardous materials due to the small scale nature of continuous microfluidic processes add to the advantages. Downstream handling (separation and purification) of the product can be challenging though, and initial equipment trains would need to be product specific until appropriate cleaning protocols are established.

The estimated cost of bringing one target API from development through to production, including human resources capacity building and the construction of a small production platform, is about US$10 million. With appropriate funding, this target could be achieved within 5 years as the necessary expertise is currently locally available in the research group of Professor Paul Watts, SARChI-Chair at the Nelson Mandela Metropolitan University in Port Elizabeth, South Africa. His group has shown proof of concept for the total synthesis of Lamivudine (3TC) and by extension Emtricitabine (FTC) as pictured in the scheme below. Currently the group is busy optimizing the process utilizing more cost effective catalysts in order to meet or underscore the current API market price.

Figure 3 - Synthesis of Lamivudine (3TC)



Lamivudine

Professor Paul Watts has already engaged with the South African DST and DTI to investigate local manufacture and it is highly recommended that this proposal is pursued on a SADC level, especially since Professor Joseph Fortunak, another international subject matter expert, is already involved at the Kilimanjaro School of Pharmacy in Tanzania, opening further possibilities for regional collaboration.

We would like to emphasize once more that any such endeavour can only be successful when the Department of Trade & Industry, the Department of Science & Technology and the National Department of Health are aligned at a policy level in support of local manufacture. This alignment will ensure that a development project focuses on the most relevant APIs and that the products are absorbed into the domestic HIV/ TB and/or malaria treatment programs. In the absence of this alignment, any respective process and product development will be futile.

References:

[1] https://iscmp.mit.edu/white-papers/introductory-white-paper

[2] http://www.contractpharma.com/issues/2015-06-01/view_features/continuous-process-in-pharmaceutical-manufacturing-considerations-nuances-and-challenges/

[3] Continuous Process Technology: a tool for sustainable production, C. Wiles and P. Watts, Green Chem., 2014, 16, 55; http://pubs.rsc.org/en/Content/ArticleLanding/2014/GC/C3GC41797B#!divAbstract

[4] The role of flow in green chemistry and engineering, S.G. Newman and K. F. Jensen, Green Chem., 2013, 15, 1456

9. SWOT ANALYSIS

The hera core and Review team together generated a SWOT analysis of regional production in SADC during its meeting 6-8 July 2015, and presented in the Inception report. The SWOT was further elaborated upon by the SADC TRC in its meeting of 8-12 December 2015:

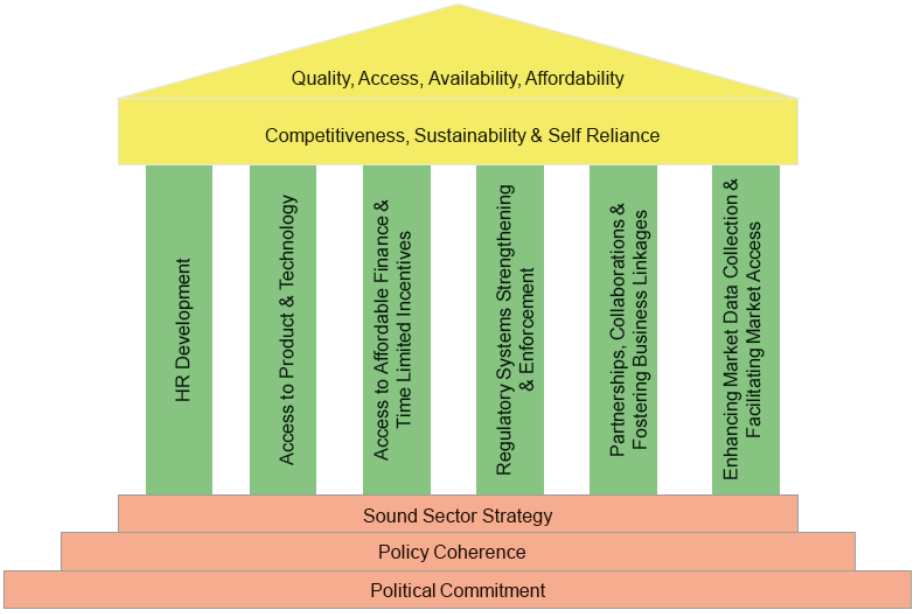
Table 13 – SWOT analysis of regional production in SADC

Strengths	Weaknesses
1. Political will 2. Written, official policies & business plan 3. MS support local production 4. Existing production base (15-24%) 5. Fast regulatory approvals after joint inspections and dossier analysis (ZaZiBoNa) 6. TRIPS flexibilities (8/15 are LDC) 7. Centres of Excellence 8. Donor interests 9. Region contributes to clinical trials	1. Poor Implementation of agreed policies 2. Poor policy coherence 3. Unevenly spread Human Resources 4. Poor Infrastructure 5. Financing gap 6. Insufficient incentives for local manufacturing 7. Unevenly spread production base 8. Limited number of regional manufacturers with GMP/WHO PQ status 9. Donor dependency culture
Opportunities	**Threats**
1. Addressing the public health crisis through mobilising local resources 2. New technologies for API production 3. Large unmet need 4. Growing market, Increasing GDP 5. Regional medicines & commodities Regulatory harmonization 6. Better professional education 7. Increase skilled HR output for pharmaceutical industry 8. Reach AU and beyond market 9. Developing SADC from cost to profit centre 10. Increased Development Partners' appetite for health system developments - potential for support in production	1. Cheaper Asian imports 2. Price dumping by competitors 3. Illegal imports of counterfeit products 4. Donor Fund $ shrinkage 5. Corruption, lack of transparency and accountability 6. Inadequate supplies of APIs/raw materials 7. Single source products (high prices patented meds, supply security) 8. Price manipulation of intermediates, APIs 9. Vertical integration 10. Lack of commitment from some MS 11. Existence of tariff barriers in some MS

10. OVERVIEW OF NEEDED ENABLING ENVIRONMENT FOR PHARMACEUTICAL PRODUCTION

The following figures of the AU Pharmaceutical Manufacturing Plan for Africa provide good overviews of the needed enabling environment for pharmaceutical production:

Figure 4 - Foundations, key interventions and ultimate ambition for a regional pharmaceutical business plan[14]



[14] Pharmaceutical Manufacturing Plan for Africa. African Union, 2012

Figure 5 - Schematic interdependence of critical aspects of the system[15]

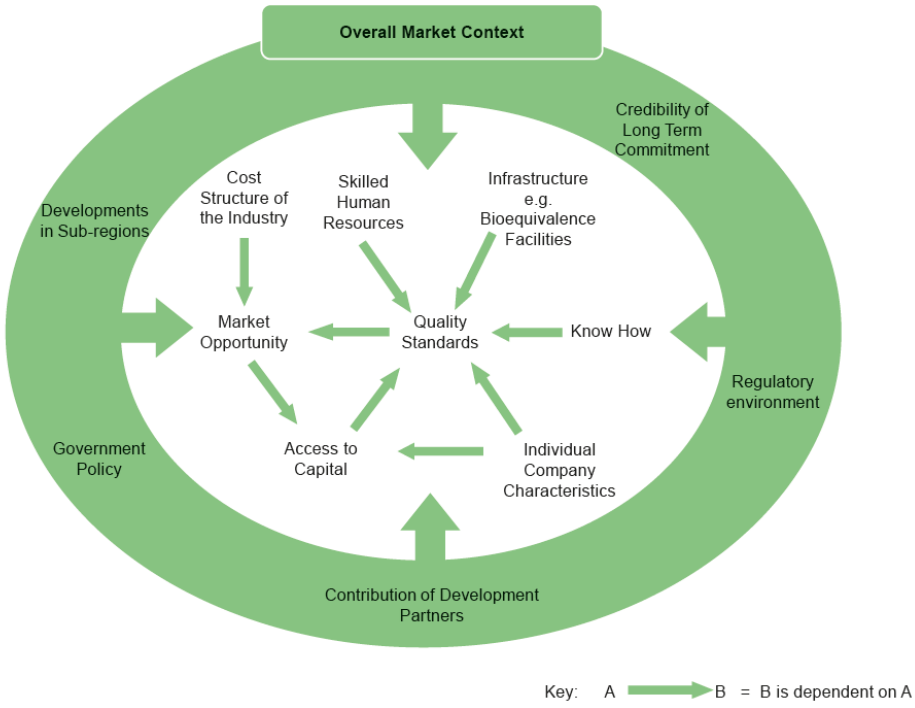
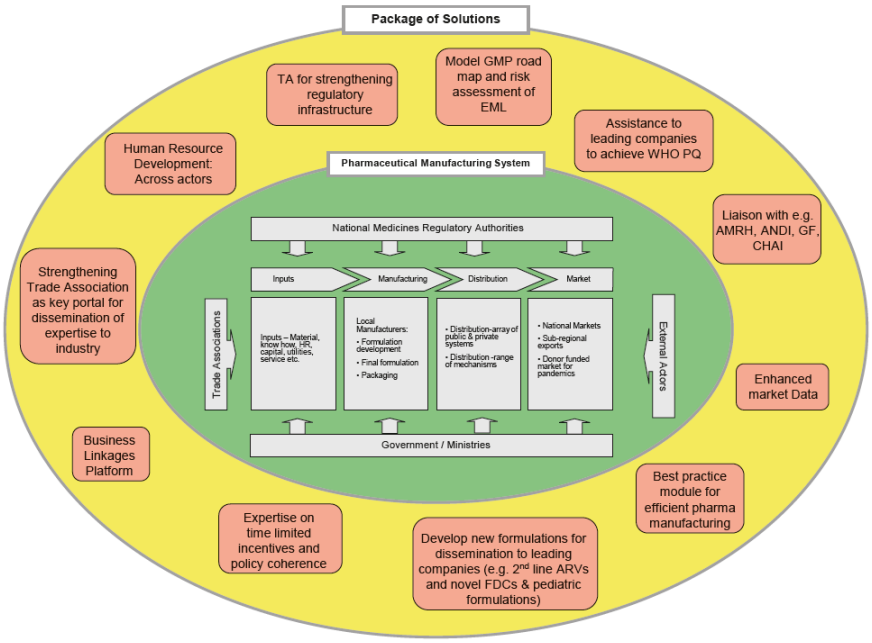


Figure 6 - Indicative package of solutions to address the wide ranging issues involved[16]



[15] Pharmaceutical Manufacturing Plan for Africa. African Union, 2012

[16] Pharmaceutical Manufacturing Plan for Africa. African Union, 2012

11. NMRAs IN SADC

SADC has 11 National Medicines Regulatory Authorities (NMRAs):

Table 14 – List of National Medicines Regulatory Authorities (NMRAs) in SADC with websites

Country	NMRA
Angola	Direcção Nacional de Medicamentos e Equipamentos, Ministry of Health http://dnme.co.ao/
Botswana	Drug Regulatory Unit, Ministry of Health http://www.moh.gov.bw/drug_regulation.html
DRC	'Direction de la Pharmacie et du Médicament (DPM)' of the Ministry of Health http://www.document.minisanterdc.cd/index.php/direction/76-direction-de-la-pharmacie-et-du-medicament-dpm
Lesotho	There are no legal provisions establishing the powers and responsibilities of the NMRA
Madagascar	'Direction de la Pharmacie, des Laboratoires et de la Médicine Traditionnelle' (Agence du Médicament de Madagascar') of the Ministry of Health http://www.agmed.mg/index.htm
Malawi	Pharmacy, Medicines and Poisons Board (PMPB) http://www.pmpb.malawi.net (offline – Nov 2015)
Mauritius	There is no NMRA (only a Pharmacy Board which is regulated by the Pharmacy Act)
Mozambique	'Departamento Farmaceutico' of the Ministry of Health http://www.misau.gov.mz/ (site is down for maintenance- Nov 2015)
Namibia	Namibia Medicines Regulatory Council (NMRC) http://www.nmrc.com.na/
Seychelles	There are no legal provisions establishing the powers and responsibilities of the Medicines Regulatory Authority, which executes some tasks inside the MOH.
South Africa	Medicines Control Council (MCC; being converted to SAHPRA) http://www.mccza.com/
Swaziland	There is no NMRA but a task team meets to work on urgent pharmaceutical issues
Tanzania	Tanzania Food and Drugs Authority (TFDA) http://www.tfda.or.tz/
Zambia	Zambia Medicines Regulatory Authority (ZAMRA) http://www.zamra.co/
Zimbabwe	Medicines Control Authority of Zimbabwe (MCAZ) http://www.mcaz.co.zw/

12. NATIONAL QUALITY CONTROL LABS IN SADC

SADC has 10 National Quality Control Laboratories. Another 2 countries outsource their QC needs to other countries or private sector QC laboratories:

Table 15 – National Quality Control Laboratories in SADC

Country	National QC laboratory
Angola	There is no National Quality Control Laboratory: need was expressed, but also information found that it was outsourced to Namibia QC lab
Botswana	National Health Laboratory, Ministry of Health
DRC	There is no national quality control laboratory, but with external support a feasibility study for the creation of a national quality control laboratory is being prepared
Lesotho	There is no quality control laboratory
Madagascar	Agence de Médicaments
Malawi	National Drug Quality Control Laboratory (NDQCL)
Mauritius	Government Analyst Division of the Ministry of Health (however, a lot of quality control tests are sent to QuantiLab)
Mozambique	Laboratório Nacional de Controlo de Qualidade de Medicamentos, Ministry of Health
Namibia	Quality Surveillance Laboratory
Seychelles	Laboratory for Quality Control (close collaboration with MRA in MOH)
South Africa	SA has no National QC lab. The Regulatory Authority has contracted the services of the CENQUAM lab at the University of North-West, Potchefstroom
Swaziland	There is no quality control laboratory
Tanzania	Tanzania Food and Drugs Authority (TFDA)
Zambia	Zambia Medicines Regulatory Authority (ZAMRA)
Zimbabwe	Medicines Control Authority of Zimbabwe (MCAZ)

13. STATUS OF INFRASTRUCTURE NEEDED FOR SYSTEMATIC QUALITY ASSURANCE AND QUALITY CONTROL

Table 16 - Infrastructure needed for systematic quality assurance and quality control

ToR#	Summary status	Typical examples
	Enabling Environment	
5	To assess the status of the infrastructure needed for systematic quality assurance and quality control (e.g. Laboratories – SNRLs, NRLs);	
	Except for the smaller Member States like Seychelles, Swaziland and Lesotho, most of the Member States have a functional National Medicines Regulatory Authority, GMP standards and inspectors, and a National Quality Control Laboratory for Medicines. Mandates and capabilities of these institutions vary across the region.	***South Africa***: Besides the South African Medicines Regulatory Authority (MCC), the South African Bureau of Standards (SABS) offers a number of accredited services for the quality assurance of medical devices and commodities including condoms, bed nets, syringes and packaging. The testing of condoms in particular is a core competence in the SABS and is conducted in the Condom Testing Laboratory. It presently conducts tests for both local and regional manufacturers (other SADC countries). ***Botswana***: Condoms are currently controlled by the DRU (Drug Regulatory Unit), even though the custodian of the national condom quality standards is the Botswana Bureau of Standards (BOBS). Other medical commodities are 'monitored' by the Biomedical Engineering Department of the Ministry of Health. This department does not control or register the commodities; it rather assists the Central Medical Stores, with specifications for these commodities and basic quality checks to assure compliance to the specifications. ***Angola***: While a National Medicines Regulatory Authority exists, there is no National Quality Control Laboratory. The General Inspectorate of Health is also involved in quality control of health care products through donor-funded projects. ***Zambia:*** The Zambia Medicine Regulatory Authority (ZAMRA) controls medicines, but is not responsible for control of imported condoms, as this function is the responsibility of the Zambia Bureau of Standards (ZBS).

14. CERTIFICATION/LICENCING REQUIREMENTS BY RELEVANT INSTITUTIONS

Table 17 - Certification/licencing requirements by relevant institutions

ToR#	Summary status	Typical examples
	Enabling Environment	
9	To specify the Certification/Licensing requirements by relevant institutions (e.g. National, Regional and International, WHO prequalification, PIC/S certification, National Drugs Control Authorities;	
	In the majority of the Member States, certification/licensing is the responsibility of the NMRA. Many companies are GMP approved by their national NMRAs, but interpretation of standards differs. Only South Africa's Inspectorate is PIC/s approved, and only Aspen Pharmacare in South Africa currently has WHO Prequalified products.	***Tanzania***: A number of institutions are involved in certification/licensing of premises: 1. TFDA – Tanzania Food and Drugs Authority 2. Tanzania Pharmacy Council (PC) 3. Tanzania Bureau of Standards (TBS) 4. Tanzania Pesticide Control Board 5. Public Health Private Laboratory Board 6. National Environmental Control Board ***Malawi***: Different organisations looking at various aspects are involved in certification/licensing of premises: 1. Ministry of Labour 2. Ministry of Industry and Trade 3. City or Town Council 4. NMRA

15. REGULATORY LANDSCAPE

Table 18 – Regulatory landscape

ToR#	Summary status	Typical examples
	Enabling Environment	
10	To assess the Regulatory landscape with respect to WTO/TRIPS Flexibilities, NMRAs, cGMP and Enforcement through regular inspection (by Regulatory Authorities) of production plants as well as distribution facilities to ensure adherence to Good Manufacturing Practices (GMP), Good Distribution Practices (GDP) and Good Warehousing Practices (GWP) and prevent sub-standard and counterfeit products from entering the SADC market	
	Member States have different stages of development of their NMRAs; this makes collaboration complicated as the weaker NMRAs need support and capacity building from more advanced NMRAs. Information exchange, work sharing, joint assessment of regulatory dossiers and GMP visits will be needed if a regional market of harmonized quality standards and regulation is wanted. There are SADC guidelines since 2004, but not all Member States have adopted or implemented the SADC standards in the same way. Harmonisation and adoption of the SADC GMP guidelines in a coherent way, combined with mutual inspection of those guidelines, can lead to easier access to medicines and commodities produced in the different SADC Member States. This also would enhance pooled procurement.	***South Africa***: The Medicines Regulatory Authority, has a team of inspectors which use the PIC/s guidelines to carry out GMP inspections. ***Botswana***: Botswana Guidelines on Good Manufacturing Practices are adapted from WHO Guidelines. Annual Inspections take place, plus random/ unscheduled inspections as deemed necessary by NMRA. International manufacturers are inspected every 5 years ***DRC:*** While the NMRA confirms there are sufficient Inspectors, enforcing is reported as a problem. ***Zimbabwe:*** Good Wholesaling Practice Guidelines are available from the MCAZ website.

16. EXAMPLES OF GOVERNMENT POLICY (IN-) COHERENCE IN SADC

Table 19 - Examples of government policy (in-) coherence in SADC

Country	Description
Tanzania	Strategy for promotion of domestic pharmaceutical production in Tanzania (2013 – 2023) is a good example of an early Member State effort to improve coherence.
South Africa	The Department of Health has powers in art 15C of the Medicines Act to use TRIPS flexibilities to promote access to medicines, but the Patent Office in Department of Trade and Industry is approving all patent applications without substantial examination.
Botswana	Gemi-Rubber was offered land to build a new condom factory with an annual production capacity of over 1 billion condoms. On the other hand, the Government of Botswana has not been procuring condoms for the last two years because UNFPA donated free condoms to the country.
Malawi	Imported finished formulations attract no taxes at time of importation but locally produced pharmaceuticals attract taxes initially through starting and packaging materials. Refund of such taxes under the rebate scheme takes place only much later. Similarly, at procurement by tender, foreign suppliers do get financing guarantees through letters of credit whereas local suppliers deliver on open credit terms and often experience payment delays.
Mozambique	FDF for use in public health system are exempted from importation taxation while API aren't. This jeopardises Mozambique's position to compete with international companies.

17. GOVERNMENT SUPPORT TO THE PHARMACEUTICAL SECTOR THROUGH THE PROCUREMENT PROCESS

Table 20 - Government support to the pharmaceutical sector through the procurement process

ToR#	Summary status	Typical examples
	Enabling Environment	
2	To ascertain the level of Government support to the pharmaceutical sector through the procurement process (e.g. local preference schemes, price advantage etc.);	
	Malawi: The government, through tenders run by CMST, is actively promoting local manufacturers in the "Buy Malawi" campaign. There is a signed MOU for 5 years between the Ministry of Industry and Trade, acting through CMST, and the Pharmaceutical Manufacturers Association of Malawi (PhaMAM) to deliver a certain number (20) of locally produced medicines at a negotiated price. Medicines in MOU are not put up on tender but obtained directly from the local manufacturers through framework agreements. ***Tanzania***: A local manufacturer is given an advantage of 15% above an international supplier in all pharmaceutical procurement tenders ***Zimbabwe***: Zimbabwe National Medicines Policy states that "the Government will encourage and support the production of medicines within Zimbabwe, both within its institutions or by others, provided such production is cost-effective and the standards of cGMP are attained and maintained at all times." ***Botswana***: The following price preferences apply on all Government tenders; 1. 5% for joint ventures between local and foreign entities 2. 10% for Citizen-owned companies 3. 15% for Joint ventures between citizen-owned entities ***South Africa:*** Has powers to apply "designation" in tenders, and has pressed bidders for the huge ARV tender to add value in local production.	

18. GOVERNMENT INCENTIVES TO THE PHARMACEUTICAL MANUFACTURING SECTOR IN THE SADC REGION

Table 21 - Government incentives to the pharmaceutical manufacturing sector in the SADC region

ToR#	Typical examples
	Enabling Environment
3	To identify current Government incentives to the pharmaceutical manufacturing sector in the SADC region – infant industry protection, tax incentives, duty-free importation (e.g. of raw materials and medicines), grants;
	Zambia: The Lusaka South Multi-Facility Economic Zone (LSMFEZ) was declared a Multi Facility Economic Zone (MFEZ) in June 2010 by the Government of the Republic of Zambia to promote manufacturing, stimulate export activities, technological development, skills transfer, and job and wealth creation and to attract both foreign and local firms through a number of incentives. NRB Pharmaceuticals is currently constructing a manufacturing plant in the Zone; Mylan is planning a repackaging / production facility for ARVs, and the French company Pharmacie Développement recently announced it would also establish a pharmaceutical plant in the Special Economic Zone. ***Malawi***: Manufacturing companies can deduct operating expenses incurred up to 24 months before the start of operations. Indefinite losses carry forward for tax allowances. Losses are carried up to 7 years.[17] ***Angola***: The key objective of the 'Pauta Aduaneiro' (Customs Tariff rates) is promotion of local production by discouraging import of goods or products that can be or are already locally produced, but there are no specific incentives for the pharmaceutical sector. ***Namibia***: Construction by manufacturing enterprises for manufacturing purposes can be written off at the rate of 20 percent in the first year and the balance at 8 percent per year over the ensuing 10 years (applies to all sectors). ***South Africa***: Start-up companies can receive infant support including business incubation (such as at the Innovation Hub), tax grants, support for R&D, marketing support and training support. The government provided financial support through the Department of Trade and Industry (DTI) to the Ketlaphela project (ARV API manufacturer) via incentives like the Critical Infrastructure Fund and the 121 Tax Allowance.[18] ***Mozambique***: There is no specific policy for grants to factories, but these can however be attributed in exceptional occasions through negotiation. There is an example of a grant for wheat flour for the production of bread.

[17] http://www.malawi-invest.net

[18] www.thedti.gov.za/news2013/ipap_2013-2016.pdf

19. R&D INFRASTRUCTURE

Table 22 - R&D infrastructure

ToR#	Typical examples
	Enabling Environment
7	To assess the R&D infrastructure (institutions, laboratories, human resources, financing etc.) and determine the amount of Government R&D spend for pharmaceuticals development in SADC Member States
	Tanzania: A to Z Textile Mills Ltd does R&D in close collaboration with Sumitomo Chemical Company of Japan in – Vector Biology; Agronomy, Analytical Chemistry and Molecular Biology. ***South Africa:*** Aspen does very little R&D: it innovates through acquisition and licensing. R&D for Sanofi is not done in South Africa: It is done at the R&D plant in Goa, India, for the TB products. ***Zimbabwe:*** Problems started around the year 2000 as a result of the country's economic slump. From 2003, R&D started dying down. Shareholders of CAPS had no capacity to invest. ***Madagascar***: The government does not invest in R&D. There are two research institutions where R&D could take place (IMRA and the national institute for pharmaceutical research). They do some applied research for international companies related to medicinal plants. BIONEXX has in-house researchers to increase the yield of the *Artemisia Annua* plant and to increase the productivity of their extraction process. ***Mozambique:*** Through bilateral support from the government of Spain, the Mozambican Manhiça Health Research Centre has contributed to the development and evaluation of new malaria control strategies, with studies of the RTS,S/AS malaria vaccine candidate and new artemisinin-based combination treatments.

20. AVAILABILITY OF REQUIRED SKILLED HUMAN RESOURCES

Table 23 - Availability of required skilled human resources

ToR#	Typical examples
	Enabling Environment
8	To assess the availability of required skilled human resources (for production, quality assurance, process maintenance, regulatory compliance, design & packaging & distribution, R&D etc.);
	Namibia: There is a regulatory authority but there are insufficient skilled resources to run it properly. There are currently insufficient skilled HR in Namibia for increased production of pharmaceuticals. However the School of Pharmacy is working towards reducing this shortage by training Pharmacy Technicians and doing some basic industrial pharmacy in the BPharm degree. ***Malawi***: The NMRA is a small institution with few members of staff to smoothly run its regulatory activities. Some of the members of staff are undergoing regular training to upgrade their skills for better effectiveness. ***South Africa***: Mostly the GMP inspection personnel are trained by international persons who spend time in the country working with the staff of the medicines control council. ***Botswana***: While the relevant skills are available at the NMRA, their numbers are not enough to fully and effectively run the regulatory authority. Hence, the authority has to outsource some normal regulatory functions to private consultants; this includes evaluation and approval of product dossiers. There is no local course specifically for regulators. ***Tanzania***: The Kilimanjaro School of Pharmacy (KSP) – St Luke's Foundation (SLF) offers an advanced training programme in industrial pharmacy under its Industrial Pharmacy Teaching Unit (IPTU) in collaboration with Purdue University and Howard University, USA. The Industrial Pharmacy Advanced Training Program (IPAT) consists of four courses - Drug Development, Drug Manufacturing, Regulatory Affairs, and Quality Compliance. The Pharmaceutical Research and Development Laboratory at Muhimbili University of Health and Allied Sciences (MUHAS) in Tanzania offers short courses in qualification and validation in Pharmaceutical Manufacturing, Pharmaceutical Analysis (method development and validation), Pharmaceutics (fluid bed drying, granulating and coating, granulation and tableting), Quality Assurance and Quality Control. ***Angola***: The country has few qualified staff, most of them trained in Cuba, Russia, Germany, Portugal, UK and France. To bridge this gap, the Health Development Plan aims to promote continuous training of health personnel to support the local production of medicines and other health products

21. PHARMACEUTICAL INDUSTRY-ACADEMIA LINKAGES

Table 24 - Pharmaceutical industry-academia linkages

ToR#	Typical examples
	Enabling Environment
11	To assess the extent of pharmaceutical industry-academia linkages.
	Malawi: There are skilled human resources to run at least one GMP compliant plant but not enough to sustain the whole industry at such standards. There is no specially designed relevant postgraduate training to prepare personnel for such skill at the University's Pharmacy Department nor any local institution. Known pharmacists have received training or acquired experience on the job or elsewhere. ***Namibia:*** The School of Pharmacy is planning to start an MPharm in Industry and Regulation. ***Tanzania***: The majority of the pharmaceutical staff has been trained in country for basic degree and technician skills while post-graduate training is done outside the country. Kilimanjaro School of pharmacy will provide a postgraduate course on Pharmaceutical manufacturing. ***Zimbabwe***: The programs offered are not specifically for pharmaceutical manufacturing, so graduates will have to undergo on-the-job training in order to acquaint themselves to the manufacturing field.

22. EXAMPLES OF FINANCING FOR REGIONAL PRODUCTION

Existing pharmaceutical production units can issue bonds or shares to finance an expansion of their existing production capacity or to purchase or take-over another pharmaceutical production unit. Banking facilities are also available to offer funding. Foreign companies are willing to (co-)invest. The South African government is also willing to enter in public-private partnerships to promote the production of certain pharmaceutical compounds. This often involves the Ministry of Health, the Ministry of Industrial Development Cooperation, the Ministry of Finance and other relevant ministries.

Funding for investments to start up or to expand a production unit can be found through the following means:

1. Self-funded
2. Bank credit: local or international private banks
3. Privately held capital either with individuals or with private equity funds in the form of angel investors, venture capital funds and others (foreign direct investment or FDI).
4. National public-private partnership: government investment functions as a multiplier or facilitator for private funds.
5. International public-private partnerships: donor countries contribute to private sector investments. This is often done through multi- or bi-lateral development banks (IFC, ADB, KfW, FMO etc.)
6. Industry – NGO / donor partnership: NGO / donor (co-)funds / invests, also as a multiplier or facilitator for private funds.
7. Industry – industry partnerships: established pharmaceutical companies invest in the creation or expansion of pharmaceutical companies in low and middle income countries (FDI)
8. Local public equity (pension funds, social security funds)
9. Stock markets (initial public offering or the issue of additional shares)

A number of concrete examples of funding mechanisms that are supported by donor governments, development or investment banks and others are:

1. http://www.cifafund.ca/en/. The Canada investment fund for Africa
2. http://www.emergingafricafund.com/. Emerging Africa infrastructure fund
3. http://www.ifhafund.com/. Investment funds for health in Africa. This fund is backed by the IFC, the ADB, DEG and the Bill & Melinda Gates foundation amongst others.
4. http://amiif.sarpam.net/. The African Medicines Impact Investment Fund that has been created under the SARPAM project.
5. http://xsmlcapital.com/industries/healthcare/. An investment fund manager focussing on frontier markets (DRC, CAR) including pharmaceutical industry

Looking at the SADC countries many of the conditions to attract foreign institutional investors are not available. The result is that, as indicated above, the local manufacturers are often small and privately owned.

The main exception in SADC is South Africa where a variety of financing options are available for new and existing ventures. The general conditions to promote investments are also better assured than in most other SADC countries with the possible exception of Botswana.

23. WILLINGNESS OF THE INDUSTRY TO EXPAND

Table 25 - Willingness of the industry to expand

ToR#	Typical examples
	Business case for local production
12	To assess the willingness of pharmaceutical companies currently operating in the SADC region to expand, upgrade and/or modernize their operations in order to produce and supply identified pharmaceutical products (i.e. essential medicines and health commodities) to the regional and international market.
	Zimbabwe (Varichem): The company emphasised that financial benefits in WHO Prequalification are very limited. Hence, the required funds for the prequalification versus the promised gains make it difficult to attract funding. ***Zambia (NRB):*** Key technical staff are recruited from India (IT, QC, and QA). NRB advertised for positions for technical staff in Zambia, however, it was reported that the response was poor. NRB is considering recruiting from the SADC region. ***Malawi (SADM)***: The biggest need is training of staff. More staff are needed in quality assurance and more pharmacists are needed for continuity. So far most graduates are being absorbed into the public sector and reliance is on expatriates. ***South Africa (Aspen):*** Of the 12 facilities, only one company has obtained WHO prequalification for its products. The facility had struggled to get any products through the Prequalification process and there has been no benefit. The company is focussing on different areas and does not see its future in ARV, TB or malaria. ***South Africa (Fresenius):*** The company is currently in a planning process for a big upgrade for the small volume parenteral plant (vials and ampoules) that will increase capacity to 100 million units. ***Botswana***: Both condom companies have plans at advanced stage, to build new state-of-the-art condom manufacturing facilities; while there are no specific plans to be WHO pre-qualified, the facilities will be built to meet WHO specifications. ***Tanzania (A to Z Textile Mills):*** Increasing capacity would need to be linked with an assured and sustainable market and access It would not make sense to expand, if the additional capacity cannot be sold.

24. WILLINGNESS OF KEY PLAYERS TO PROCURE FROM SADC REGION

Table 26 - Willingness of key players to procure from SADC region

ToR#	Typical examples
	Business case for local production
13	To assess the ability and willingness of key industry players (e.g. Governments, donor-funded procurement agencies, wholesalers, retailers (pharmacists) and consumers) to buy/consume high quality generic essential medicines and accompanying/related health commodities manufactured in the SADC region.
	Malawi: Funding and procurement for these commodities is almost entirely done by development partners in consultation with MOH and CMST. They use their own policies and guidelines, which largely exclude the small local and regional manufacturing industry due to low capacity, uncompetitive prices and also lack of registration in the Malawi market. Malawi does not really participate in making decisions on where to purchase HIV, TB and first line malaria medicines and commodities (ACTs and LLINs) from. Goods are delivered directly by donors' procurement agencies. ***DRC***: Pharmakina had the necessary HR, technical and financial resources to become WHO Prequalified for ARVs. It had an agreement with the government (MOH) to produce ARVs and the treasury had liberated the necessary funds to purchase. A change of government meant that the MOH used the funds for other purposes. ***Zimbabwe***: Varichem stated that financial benefits of WHO Prequalification are very limited. Hence, the investment for Prequalification compared to expected gains makes it difficult to attract funding. ***Botswana:*** While all the companies are willing to go for WHO Prequalification, they all feel that there are currently no incentives, financial or otherwise, to justify the time and related expenses. The pharmaceutical companies are setup to do pre-packaging; WHO does not pre-qualify packaging plants. Condoms are imported in Botswana without any VAT or customs duty. However, all equipment, raw materials and other inputs used in the local manufacturing of condoms are charged VAT and import duty. This means that locally manufactured condoms will always be more expensive than imported condoms; this puts local manufacturers at a huge disadvantage during public procurement tenders, which are always price sensitive. ***South Africa***: Fresenius states that one of the big issues is that there is currently no import tariff on pharmaceutical products from China and India that makes it difficult to compete. There are trade agreements between the SADC countries but also between South Africa and the BRICS countries. The pharmaceutical industry is one of the industries that has been selected for industrialization. It seems as if there is some political pressure because companies with SA manufacturing plants were invited to attend a meeting to discuss local production. **Madagascar**: While the government would like to procure in the SADC region, language seems to be a problem. Few Anglophone African countries react to the tenders issued by the CMS. Indian suppliers are willing to invest in the translation or a translator. Moreover, product prices from African based manufactures do not seem to be competitive.

25. DEMAND AND SUPPLY DISTORTIONS

Table 27 - Demand and supply distortions

ToR#	Typical examples
	Business case for local production
16	To determine the demand and supply distortions in terms of effective operational control of supply chain systems for pharmaceutical manufacturing (e.g. forecasts, inventory status, backlogs, production schedules, supplier delivery schedules, pipeline inventory etc.).
	Malawi: Current framework contracts under the "Buy Malawi" campaign are facilitating planning. However, cash flow problems (no advance financing by government for orders and delayed payments by CMST) and the high interest rates from banks lead to underutilisation of local capacity. ***Zimbabwe***: The unstable economy makes it difficult to measure demand. Zimbabwe is a landlocked country, hence bringing in raw materials takes time. This makes it difficult to maintain a sufficient inventory level. ***Tanzania***: Competition from imported pharmaceuticals, especially from India, affect working capital negatively: capital is often tied up in VAT waiting to be refunded. A to Z Textile Mills mentioned the lack of demand forecast, which makes it difficult to plan for importation of raw materials, and the consequent need to hold large stocks of raw materials

26. INVENTORY MANAGEMENT ISSUES

Table 28 - Inventory management issues

ToR#	Typical examples
	Business case for local production
17	To determine inventory management issues (e.g. associated costs, insurance, taxes, etc.).
	DRC: It takes a long time to import goods so that the company has to maintain a high security stock, which represents a high value. Insurance has to be paid. ***Tanzania***: Since almost all the raw materials are imported then it means that huge working capital is required to run the plant smoothly. TPI highlighted significant loss of value of inventory mainly due to the fluctuation of the Tanzanian Shilling against major currencies ***Botswana***: All the manufacturers interviewed accept the fact that their inventory management is poor and ineffective at best; they all report the following; 1. Lack of a clear and concise Inventory management system 2. Inadequate demand forecasting makes it difficult to know how much raw material to keep in stock, and how much finished stock to carry. So, frequent lack of space for storage. 3. Most of the raw material comes from abroad, with delivery times of 4-6months. Hence, the turn-around times are long. 4. Limited on-shelf availability of finished products, hence, significant loss of sales; at times, it takes about 8months to deliver, after an order has been placed. 5. Unqualified Staff; poor control and unaccountability of both raw and finished stock stemming from inaccurate checks and balances 6. Frequent raw material stock-out resulting in disruption of production; loss of productivity 7. Improper storage facilities leading to spoilage and waste; this can be costly 8. Significant resources are tied up in inventory 9. Expensive Insurance

27. POSSIBLE SOURCES OF FINANCING FOR REGIONAL PRODUCTION OF ESSENTIAL GENERIC MEDICINES

Table 29 – Possible sources of financing for regional production

ToR#	Typical examples
	Business case for local production
18	To identify possible sources of financing for regional production of essential generic medicines, such as Government, Healthcare Insurance Schemes, company's own funds, Development Finance Institutions (DFIs), foreign direct investments (FDIs), International Government Agencies (e.g. BMZ, GTZ, USAID), local and international NGOs, commercial banks, institutional investors (e.g. pension funds), venture capital firms, Private-Public Partnerships, GFATM, PEPFAR, PMI, Private Health Insurance etc.
	DRC: Zenufa benefited from loans provided by the government's Promotional Fund for the industry (not specific pharmaceutical). Pharmakina could get funds to go for WHO Prequalification from international government agencies (like GIZ and USAID), but that did not make sense from a commercial point of view: the product would be too expensive without an official domestic preference scheme or enforcement by the government to funding agencies to procure locally. ***Madagascar:*** Bionexx obtained funding from international NGOs to increase number of suppliers of plants, QA, training, product development. It also obtained funding from the Dutch government's Private Sector Investment programme. ***Mozambique:*** Brazil supported Mozambique with technology transfer, capacity building and financing the construction and operation of the ARV factory. The support was based on Brazil's own experience with the production of ARVs. ***Namibia***: Manufacturer received funding from the government's Industrial Upgrading and Modernisation Programme to upgrade the manufacturing capabilities and to purchase new equipment. ***Tanzania***: Manufacturer received funding from an international government agency (BIO) to build a GMP plant. Also, Zenufa received an HPLC and blister packaging machine from DNDi as well as all the raw materials, the formulation and the manufacturing process. Sometimes it receives reagents and standards from DNDi for this product.

28. POTENTIAL BENEFITS OF REGIONAL MANUFACTURING OF PHARMACEUTICAL PRODUCTS TO SADC MEMBER STATES

Table 30 - Potential benefits of regional manufacturing

ToR#	Typical examples
	Business case for local production
20	To clearly identify the potential benefits of regional manufacturing of pharmaceutical products to SADC Member States
	Tanzania: At Zenufa technology transfer and capacity building from DNDI took place for three years for producing artesunate / amodiaquine (AS/AQ) tablets. It has approximately 180 local staff trained in-house. ***Zambia***: The machine operators at NRB are from India and these would train the local people. NRB advertised for positions for technical staff in Zambia, however, it was reported that the response was poor. NRB is considering recruiting from the SADC region. ***South Africa:*** The Nelson Mandela Metropolitan University and the North West University provide GMP modules, which are included in formal degrees covering pharmacy and pharmaceuticals

29. PHARMACEUTICAL COMPANIES WILLING TO EXPAND PRODUCTION

Table 31 - Pharmaceutical companies willing to expand production

ToR#	Typical examples
	Operational issues
22	To identify pharmaceutical companies currently manufacturing essential generic medicines in the SADC region, and have the potential for expansion, upgrading and/or modernization of their production to supply the regional and international markets
	DRC: Pharmakina has the necessary HR, technical and financial resources to become WHO Prequalified for ARVs. Third parties (public funders) offered the financial resources for the prequalification process but Pharmakina decided that it would not make business sense as the final product would be too expensive. ***Botswana:*** While all the companies are willing to go for WHO Prequalification, they all feel that there are currently no incentives, financial or otherwise, to justify the time and related expenses. The pharmaceutical companies are setup to do pre-packaging; WHO does not pre-qualify packaging plants. ***South Africa***: For Aspen there has been no benefit to date with the WHO Prequalification: Aspen had spent R10 million on prequalification of capreomycin but it did not get prequalified. Aspen has now abandoned this approach. Sanofi has sufficient technical resource capacities, but the minimum requirements for South Africa and the rest of SADC were national registration. The investment for a WHO Prequalification process was therefore not justified. Currently, however, isoniazid prequalification documents have been submitted to WHO, and Sanofi is awaiting inspection planned for 2016, and there are plans for submitting documents for prequalification of Rifa-4 in 2016 or early 2017. Main reason for WHO Prequalification is to serve the international market like Russia. ***South Africa (Fresenius):*** The company exports already its products within the SADC region, and is currently in a planning process for a big upgrade for the small volume parenteral plant (vials and ampoules) that will increase capacity to 100 million units. ***Mozambique***: While the Brazil supported plant has plans to go for a WHO Prequalification, there are doubts about the feasibility and sustainability (e.g. plant is not able to produce antiretrovirals as per current treatment guideline). Alternative options include manufacturing general essential medicines for Mozambique and the region. ***Zimbabwe***: Varichem had a WHO Prequalification for Varivar and Stalanev tablets, but WHO recently suspended their Prequalification status. The company's resources are just sufficient enough to plan for the WHO Prequalification inspection in 2016.

30. PERTINENT PRODUCTION RELATED ISSUES

Table 32 - Pertinent production related issues

ToR#	Typical examples
	Operational issues
28	To assess pertinent production-related issues such as: availability of water of required quality, reliability of supply of electricity, safe disposal of waste etc.
	Zimbabwe: Varichem outsourced disposal of waste to a company specialising on sensitive waste. ***DRC***: At Pharmakina sufficient water and electricity is available. The problem is that the costs are considered high. The government uses a special industrial tariff that is significantly higher than regular tariff. The disposal of expired API or FDF is done in-house also but following the government's procedures. ***Mozambique***: The area where the Brazil supported manufacturing plant is located has a very unstable electricity supply and there are often power cuts. While the plant has a generator, the funds to keep the generator running are not always available. This may have serious consequences for the sensitive equipment of the plant ***South Africa***: Electricity at Sanofi is unreliable. This would require purchase of a generator, which is costly. Moreover, to run the generator represents 4 x the cost of electricity.

31. IP/PATENT LAWS IN SADC

Table 33 - IP/Patent laws in SADC

Country	Patent law
Angola	Industrial Property Law No 3/92, 1992
Botswana	Industrial Property Act, 2010 (in operation since 30 Aug 2012)
DRC	Law No. 82-01 of 1982
Lesotho	Industrial Property Order (1989) (currently being amended)
Madagascar	Ordonnance No. 89-019 instituant un régime pour la protection de la propriété industrielle en République démocratique de Madagascar de juillet 1989 (Titre 1) (Art 3 a 54) (JO d'Aout 1989)
Malawi	Patents Act, Chapter 49:02, 1959
Mauritius	Patents, Industrial Designs, and Trademark Act No. 25 of 2002
Mozambique	Industrial Property Code: Decree No. 4/2006.
Namibia	Industrial Property Act, Act No. 1, 2012
Seychelles	Industrial Property Act, 2014
South Africa	Patents Act 1978
Swaziland	Patents, Utility Models and Industrial Designs Act No. 6 of 1997
Tanzania	Patent Act 1987
Zambia	Patent Act, Cap 400, 1957
Zimbabwe	Patents Act Cap 26_03, 1971

32. TRIPS FLEXIBILITIES AVAILABLE IN NATIONAL IP/PATENT LEGISLATION

The status of TRIPS flexibilities in national IP/Patent laws was assessed by SARPAM in 2012[19]

1. LDC status: allows the country to ignore the TRIPS agreement until 2021, and pharmaceutical patents until 2033
2. Parallel import: "International" exhaustion allows the importation of (a cheaper version of) the patented product from any country in the world. "National" exhaustion or no specific provision does not allow this.
3. Bolar: if this clause is enabled, this allows a generic company to already test the product and offer samples to the National Medicines Regulatory Authority while the patent of the originator product is still valid. Stockpiling or sales of the product is only allowed the day after the patent expires.
4. Compulsory or government use license: allows the country to switch off the patent in certain circumstances, such as public health reasons. Most important flexibility clause.

Specific legal advice for SADC countries is available in section 34 and in the SARPAM legacy report[20].

Table 34 - TRIPS flexibilities available in national IP/Patent legislation

Country	LDC?	Parallel import?	Bolar?	CL / government use?
Angola	Yes	No specific provision	No specific provision	Yes
Botswana	No	International (s.25. (a)	Yes (s.25 (h))	Yes
DRC	Yes	Situation Unclear	No	only non-working after 3 years
Lesotho	Yes	Situation Unclear	No	only non-working after 3 years
Madagascar	Yes	National (Art 30(2))	No	only non-working after 3 years
Malawi	Yes	Not Specified	No	only non-working or anti-competitive
Mauritius	No	International (S.21 (4)(a))	No	only non-working after 3 years
Mozambique	Yes	National (Art. 68(b))	No	emergency, non-working
Namibia	No	International (S. 43(1)(a))	Yes (S.43 (2))	only non-working after 3 years
Seychelles	No		No	only non-working after 3 years
South Africa	No	International (S.45 (2))	Yes (S. 69A)	abuse, non-working, excessive price
Swaziland	No		No	yes, public interest
Tanzania	Yes	National (s.38 (2))	No	only non-working, vital importance
Zambia	Yes	No explicit provision	Not in current law. Yes in Bill	only non-working after 3 years
Zimbabwe	No	International, " if the cost of importing" a product "is less than the cost of purchasing from the patentee" (S.24A)	Yes. "Test batches" of a patent product may be produced, but not put on the market, six months before expiry (S.24B)	only non-working after 3 years

[19] Musungu S. Pharmaceutical Patents, TRIPS Flexibilities and Access to Medicines in SADC. SARPAM 18 September 2012. Available in English / French / Portuguese from http://ttatm.sarpam.net/overview/

[20] See the SARPAM legacy report, available in English/French/Portuguese at http://ttatm.sarpam.net/sadc/

33. USE OF TRIPS FLEXIBILITIES IN SADC

Table 35 - Use of TRIPS flexibilities in SADC

ToR#	Summary status	Typical examples
	Enabling Environment	
4	To assess the extent to which SADC Member States utilize TRIPS flexibilities as reaffirmed by the Doha Declaration in the production of essential medicines	
	All pre-2005 patented products can still be generically produced in India and are supplied to SADC at very competitive rates. For post-2005 patented products Indian companies cannot automatically make generics unless the patent is refused or declared invalid (e.g., Gleevec, imatinib) or a compulsory license is issued in India (several cancer medicines). This opens a possible niche for LDC-based companies in SADC as Indian manufacturers will not be able to produce in India. Licenses for almost all important ARVs are however available from the Medicines Patent Pool for generic production in specified countries (needs a product specific analysis, but nearly always includes India and sometimes also Africa. Strict criteria for GMP and quality are limiting the choices in Africa). TB and Hepatitis-C medicines have recently been included in the Medicines Patent Pool. The 8 Least Developed Countries in SADC have no obligation to honour TRIPS or patents until 2021, or pharmaceutical patents until 2033. Other countries can use TRIPS flexibilities, provided they have been included in national IP/patent legislation.	***Zimbabwe:*** Government use license for all ARVs (2002, valid 5 years). Successful use of TRIPS flexibilities (2001-2006) which helped Varichem to produce ARVs despite valid patents. Unfortunately the international community changed its first-line treatment to tenofovir based FDCs, so Varichem could not sell the old combination with stavudine. ***Zambia and Mozambique***: Compulsory licenses were also issued but these did not result in local production of ARVs ***Tanzania***: The TPI – ARV plant in Arusha was built to produce ARVs while utilizing the TRIPS flexibilities. The plant is not operational (for other reasons) ***South Africa***: Although South Africa has put powers to use TRIPS flexibilities in art 15C of the Medicines Law, it has never used this power to promote access to medicines. South Africa Patent Office is granting all patents without substantial examination – this is not conducive for getting access to patented medicines. The IP Policy is currently being reviewed; this will likely lead to amendments in the SA Patent Law (which has TRIPS plus features) ***Malawi***: Importance of TRIPS in production or procurement of medicines does not appear to worry manufacturers or the CMST. None of the manufacturers are producing newer patented medicines nor are they planning to without cooperation with other international well-established players. ***Botswana***: There are provisions in the Botswana Law for TRIPS Flexibilities, but none have ever been used in the country before.

34. TRIPS FLEXIBILITIES AND REGIONAL PRODUCTION

This section[21] provides SADC Member States with legal advice on how they can utilize the TRIPS flexibilities to promote better access to medicines or local production.

Legal pathways to address patent issues in the context of regional production:

1. Obtain a voluntary license from the patent holder
2. Obtain a voluntary license from the Medicines Patent Pool
3. Obtain a compulsory license from a government authority
4. Government use of the patent
5. Least Developed Country transition periods

1. Obtain a voluntary license from the patent holder

The patent holder can authorize a third party, such as a local producer of medicines to make use of its patent. This is usually done through a voluntary license. Such a license sets out terms and conditions under which the third party may operate. For example the agreement can determine where the product can be offered for sale, make arrangement for technology transfer, collaboration on regulatory matters, contain a waiver for data exclusivity, payment of royalties, and contain provisions for dispute settlement etc. Example: Aspen Pharmacare (South Africa)

2. Obtain a voluntary license from the Medicines Patent Pool

All World Health Organization (WHO) recommended first line antiretroviral (ARV) regimens for adults and children are licensed to the Medicines Patent Pool (MPP). The MPP also holds licenses for the most promising new ARVs.[22] This means that the MPP can provide sub-licenses to third parties for the production and supply of generic ARVs. Some MPP licenses have limits as to where sub-licensees can be based. For example the Gilead licenses require producers to be in India, China or South Africa. However it may be advisable to explore with the MPP whether such restrictions can be lifted in case a well-prepared production plan is developed. All licenses available from the MPP are publicly posted on their website.[23] This mechanism has not yet been used in SADC but should be studied in the feasibility phase. It also opens possibilities for making fixed dose combinations of individual ARVs patented by different companies.

3. Obtain a compulsory license from a government authority

Compulsory licensing enables a competent government authority to license the use of a patented invention to a third-party or government agency without the consent of the patent-holder against a payment of "adequate remuneration". UNDP and the WHO have provided guidelines for the determination of remuneration rates.[24] A local producer of generic medicines can request the government to grant him or her a compulsory license. Such a request should be supported by evidence that the applicant has attempted to obtain a voluntary license on reasonable grounds. This

[21] Author: Ms Ellen 't Hoen, LLM, Medicines Law & Policy adviser.

[22] http://www.medicinespatentpool.org/wp-content/uploads/MPP_ARV_Priorities_Report_4th_Edition_web.pdf

[23] http://www.medicinespatentpool.org/licensing/current-licences/

[24] The UNDP and the WHO have developed guidelines to determine royalty rates for non-voluntary licensing: http://www.us.undp.org/content/undp/en/home/librarypage/hiv-aids/access-to-drugs-via-compulsory-licensing-guidelines--non-voluntary-patent-use.html

requirement may be waived in case of national emergency or other circumstances of extreme urgency. Example: Zambia and Mozambique have issued compulsory licenses on request of local companies in 2004. [25]

A request for supply under a compulsory license can also be made by one country to another in the context of the World Trade Organization (WTO) Paragraph 6 System. This may be necessary for example in case of sourcing API from a third country where the API is patented.[26,27]

4. Government use of the patent

A government can also make use of a patent for 'public non-commercial use'. It can do this for its own use of for use by a third party. This is called 'government use' (GU) and it is a form of compulsory licensing. A government can issue a government use license and grant the rights to a local producer to make and sell a particular generic medicine. The issuance of a government use license does not require prior negotiations to obtain a voluntary license from the patent holder. Also in the case of GU the patent holder is entitled to royalty payment. Example: Zimbabwe has issued a government use license which allowed national companies (e.g., Varichem) to produce ARVs patented in Zimbabwe.

The WTO TRIPS Agreement and subsequent decisions (see section on least developed countries) sets out certain requirements regarding the way in which compulsory licences and government use authorizations should be issued.[28]

5. Least Developed Country transition periods

Least-developed countries (LDCs) are exempt from granting patents for pharmaceuticals there are two decisions of the Council for TRIPS[29] that specifically deal with LDCs and IP:

1. A 2002 decision exempts WTO LDC Members from the obligation to grant or enforce patents on pharmaceutical products, or to protect pharmaceutical test data, until 1st January 2016.
2. A 2013 decision exempts LDCs from the obligation to implement the entire TRIPS Agreement until July 2021 (with the exception of Articles 3, 4 and 5 related to national treatment and most-favoured nation treatment), or until such a date on which they cease to be a least developed country Member, whichever date is earlier.

As the 2013 decision concerns the entire TRIPS Agreement, it also exempts *de facto* LDCs from their obligations with regards to pharmaceutical patents and data protection until at least July 2021. This has recently been extended to 2033. However, the 2002 decision also specifically exempts LDCs from enforcing granted patents.

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[25] http://www.terradaily.com/2004/040903151536.58dwp9r9.html and http://www.cptech.org/ip/health/cl/recent-examples.html

[26] https://www.wto.org/english/tratop_e/trips_e/par6_modelnotifs_e.htm

[27] For example the Indian Patents Act Section 92 (A) provides:

(1) Compulsory licence shall be available for manufacture and export of patented pharmaceutical products to any country having insufficient or no manufacturing capacity in the pharmaceutical sector for the concerned product to address public health problems, provided compulsory licence has been granted by such country or such country has, by notification or otherwise, allowed importation of the patented pharmaceutical products from India.

[28] See article 31 of the WTO Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS): https://www.wto.org/english/docs_e/legal_e/27-trips.pdf

[29] https://www.wto.org/english/tratop_e/trips_e/ldc_e.htm

In practice this means that there are no barriers related to IP for LDCs to produce medicines.

The role of LDCs can be of particular importance in the context of the use of compulsory licensing by a country that is part of a regional trade area of which at least half of the members are LDCs. In such cases a pharmaceutical product produced or imported under a compulsory license may be exported to the markets of those other developing or least developed country parties to the regional trade agreement that share the health problem in question.[30]

[30] For more legal advice on procurement and production of patented medicines see: http://ttatm.sarpam.net/wp-content/uploads/Procurement-of-patented-medicines-by-SADC-MS-English-v5-final.pdf

35. LEVEL OF R&D INVESTMENTS IN SADC PHARMACEUTICAL SECTOR

Table 36 - Level of R&D investments in SADC pharmaceutical sector

ToR#	Summary status	Typical examples
	Operational issues	
27	To assess the level of investments in R&D by local pharmaceutical companies as well as foreign direct investment in R&D in the pharmaceutical sector;	
	In the majority of the MS, R&D is very limited. Generally, the R&D that is taking place is done within pharmaceutical companies; there is hardly any government support to R&D throughout the region.-	***Tanzania***: A to Z Textile Mills Ltd Tanzania does R&D in close collaboration with Sumitomo Chemical Company of Japan in – Vector Biology; Agronomy, Analytical Chemistry and Molecular Biology ***South Africa:*** Aspen does very little R&D: it innovates through acquisition and licensing. R&D for Sanofi is not done in South Africa: It is done at the R&D plant in Goa, India, for the TB products. ***Zimbabwe:*** Problems started around the year 2000 as a result of the country's economic slump. From 2003, R&D started dying down. Shareholders of CAPS had no capacity to invest. ***Madagascar***: The government does not invest in R&D. There are two research institutions where R&D could take place (IMRA and the national institute for pharmaceutical research). They do some applied research for international companies related to medicinal plants. BIONEXX has in-house researchers to increase the yield of the Artemisia Annua plant and to increase the productivity of their extraction process.

36. AVAILABILITY OF ESSENTIAL MEDICINES / ESSENTIAL MEDICINES LISTS

Only very few Member States have recent data on the percentage availability of essential medicines in public, private and not-for-profit sectors using the WHO/HAI methodology. See table below for those countries that provided such data.

All Member States have a national Essential Medicines List (EML). Except for Botswana, Lesotho and Angola, whose EML date from 2005, 2006 and 2008 respectively, the EMLs are more or less up-to-date (2009 – 2015).

Analysing and comparing the EMLs was started but not completed, as it did not provide any additional information, apart from the finding that some EMLs were no longer reflecting current treatment practices, and needed to be updated. Consultants used the Global Fund PQR database as a reflection of what was really bought and used by Member States.

Table 37 - Availability of essential medicines / essential medicines lists

ToR#	Typical examples
	Enabling Environment
6	To assess the availability of quality medicines in public, private and civil sectors and their inclusion in the national Essential Medicines List (EML);
	Tanzania: Availability of essential medicines in the public sector: 72% Availability of essential medicines in the private (and not-for-profit) sector: 85-86% ***Namibia***: No assessment using WHO/HAI methodology done. % Availability of essential medicines in public sector monitored using PMIS (Pharmacy Management Information System) on a quarterly basis. Availability of key items for Q3 of 2014/15 shown as 97%, however the % of Health facilities with no stock outs of key items during the quarter is only 23%. ***Botswana***: Percentage availability by VEN; V= 84% E= 74% N= 64%

37. SOURCES OF RAW MATERIALS AND OTHER CRITICAL INPUTS

Table 38 - Sources of raw materials and other critical inputs

ToR#	Summary status	Typical examples
	Operational issues	
25	To identify the sources of raw materials and other critical inputs (e.g. APIs, High-Density Polyethylene chips and Master Batches, spare parts etc.) and assess the availability, reliability and sustainability of supply in the SADC region.	
	Except for the API produced in the SADC region, the majority of the raw materials and other critical inputs are imported from India and China. Some of the manufacturers even import their packaging from outside the SADC region. Import procedures particularly for raw material and API are usually lengthy and cumbersome processes.	***Malawi***: Health Nets Ltd was developed under the same model as A-Z Mills in Tanzania. Current activity is finishing production of semi-produced nets by stitching them to size. The challenge is that PSI (the international procurement agent for Global Fund and PMI) is virtually killing the market for locally produced nets. The private sector market is too small and it would be uneconomical to sustain the large investment. So far operations have been suspended due to lack of market for the nets. ***South Africa***: Fresenius states that API unfortunately needs to be imported: the API for Quinine from Germany while the API for Amikacin comes from China. Sanofi is in the process of working with a potential local manufacturer for anti-TB APIs. The API plant is in Pretoria and the company is currently manufacturing APIs for veterinary products. The company is working with the Department of Trade and industry to put up an API manufacturing plant.

38. QUALITY MANAGEMENT PROCESSES

Table 39 - Quality management processes

ToR#	Summary status	Typical examples
	Operational issues	
26	To assess the level of quality management processes, such as maintaining a Master File for each product; Operational or procedural aspects of Quality Assurance (e.g. quality checks to ensure adherence to current Good Manufacturing Practices (cGMP), Good Distribution Practices (GDP), Good Logistics Practices (GLP) and Good Warehousing Practices (GWP), WHO pre-qualification);	
	The quality management processes in pharmaceutical manufacturing plants vary throughout the SADC region. Most of the plants have extensive documentation like Drug Master Files and Standard Operating Procedures in place. It depends to a large extent on the country regulations (NMRA, GMP, etc.), which are generally based on WHO standards, and on the fact whether a plant is owned or linked with a multinational pharmaceutical company.	***South Africa***: 22% of the total staff of Sanofi works on quality management. ***Malawi***: According to SADM, all products have Drug Master Files, Standard Operating Procedures are in place for all operations and national GMP standards are adhered to with yearly inspections by the Malawi Pharmacy Medicines and Poisons' Board. ***DRC***: Zenufa maintains a Drug Master File for each product. This is available in manual form, with the appropriate signatures. Zenufa has an in-house laboratory with a software to register all testing results, and it maintains an extensive sample library. ***Botswana***: Gemi-Rubber's quality management process was verified by the South African Bureau of Standards (SABS), which issued the ISO:4074 certificate.

39. ASSESSMENT OF TECHNICAL AND HUMAN RESOURCES FOR UPGRADING

Table 40 - Assessment of technical and human resources for upgrading

ToR#	Summary status	Typical examples
	Operational issues	
23	To critically assess the technical and human resource capacities of these existing pharmaceutical manufacturing firms for expansion, upgrading and/or modernization;	
	Most of the manufacturers in the SADC region interviewed claim that there are generally sufficient technical and human resources capacities, which are specific for pharmaceutical manufacturing. Obstacles for expansion, upgrading and/or modernization are usually related to lack of financial resources.	***DRC***: Zenufa has bought a terrain adjacent to its current plant and there are plans to build a state of the art production facility, which would comply with GMP and GDP. However, up to date it has not been able to secure the funds to start construction. ***Malawi***: Pharmanova indicated the following needs for expansion, upgrading and/or modernization: 1. New machines complying with current GMP standards 2. Plant infrastructure re-modelling. 3. Qualified and trained personnel. 4. Documentation improvement ***Mozambique***: The technical know-how of Mozambican nationals to run the Brazil supported manufacturing plant is in danger because quite some staff that was trained in Brazil has already left the plant to work elsewhere because of financial issues of the plant. Currently, approximately 60% of the needed staff is available at the plant.

40. LESSONS LEARNED FROM OTHER COUNTRIES

Lessons learned from other countries: India, Malaysia, Turkey, Indonesia, Egypt, Ghana, Nigeria, Kenya, Tanzania and South Africa.

Analysis of Pharmaceutical Industries in selected Developing Countries[31]

Table 41 - Analysis of pharmaceutical industries in selected developing countries

Country / Critical Success Factor	India	Malaysia	Turkey	Indonesia	Egypt	Ghana	Nigeria	Kenya	Tanzania	South Africa
Political will	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Government support	Strong	Strong	Strong	Strong	Strong	Strong	Strong	Weak	Strong	Strong
- **Policies**	√	√	√	√	√	√	√	√	√	√
- **Procurement**	√	√	√	√	√	√	√	X	√	√
- **Incentives**	√	√	√	√	√	√	√	X	√	√
- **R&D**	√	√	√	√	√	√	√	X	√	√
Human Resources	Skilled	Skilled	Skilled	Adequate	Skilled	Adequate	Adequate	Limited	Limited	Skilled
Quality infrastructure	Very Good	Excellent	Excellent	Good	Good	Good	Good	Good	Good	Very Good
Regulatory landscape										
- **WTO/TRIPS**	Yes	Yes	Yes	N/A	Yes	Yes	Yes	Yes	Yes	Yes
- **NMRA**	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
- **GMP**	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
- **Enforcement**	Stringent	Stringent	Stringent	Stringent	N/A	Stringent	Stringent	Stringent	Stringent	Stringent
Certification/Licenses										
- **WHO prequalification / PICS**	N/A Stringent	Yes Stringent	Yes Stringent	N/A Yes	N/A Yes	No Yes	No Yes	No N/A	No Yes	Yes Yes

[31] Table compiled from various sources by Mr Seth Akweshie; adapted by Marc van Robays and Wilbert Bannenberg

Country / Critical Success Factor	India	Malaysia	Turkey	Indonesia	Egypt	Ghana	Nigeria	Kenya	Tanzania	South Africa
- **National Drugs Control**										
Investments in R&D										
- **Domestic companies**	High (80%)	High	High	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	High
- **Foreign sources**	Moderate (20%)	Large	High		Moderate		Moderate	Moderate		High
API / Raw Material sources										
- **Local**	Yes (60%)	Yes	Yes	N/A	Yes	Yes	No	No	No	Yes
- **Imported**	Yes (40%)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Financing										
- **Government**	Yes	Yes	Yes		Yes	Yes	Yes	Limited	Yes	Yes
- **FDI**	Yes	Yes	Yes (+27%)	Limited	Yes	Yes	Yes	Yes	Yes	Yes
- **Healthcare Scheme**	Yes	Yes	Yes	Yes	Yes	Yes	Yes			Yes
Products										
- **Generics**	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
- **Formulations**	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
- **APIs**	Yes	Yes	Yes	N/A	Yes	Yes	No	No	No	Yes
- **Accompanying/Related Commodities**	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Market:										
- **Domestic**	Yes	30%	95%	70%	90%	30%	Yes	30-35%	Yes	Yes
- **Regional**	-	Yes	Yes	-	30%	Yes	Yes	Yes	Yes	Yes
- **International**	Yes; +24% p.a.	Yes; +(10-12)%	Yes; +9%	Yes						Yes

1. **Strong Political will and Government support**: All the countries (100%) analysed have strong political will from their governments. In addition, all the governments demonstrate strong support for the pharmaceutical industry through Policies; public procurement mechanisms; incentives (fiscal and/or monetary); and support for Research and Development (R&D);
2. **Human Resources/Skilled workforce**: Five of the ten countries (India, Malaysia, Turkey, Egypt and South Africa) have human resources development systems that equip their workforce with the required technical skills. Three countries (Indonesia, Ghana and Nigeria) have adequate human resource skilled workforce required by the pharmaceuticals industry, while Kenya and Tanzania have limited technical skills for the pharma industry;
3. **Quality infrastructure**: All the countries (100%) analysed have, at least, good quality Infrastructure in place to support the development of their pharmaceutical industry;
4. **Regulatory landscape**: All the countries (100%) have regulations and monitoring systems in place, backed by relatively stringent enforcement mechanisms. These effective regulatory landscapes ensure strict adherence to the National Medicines Regulatory Authority (NMRA) regulations, and Good Manufacturing Practices (GMP);
5. **Certification/Licensing requirements**: In the "pharmerging markets"[32] of India, Malaysia and Turkey, there are stringent National Medicines Regulatory Authorities backed by robust mechanisms;
6. **Investments in Research and Development (R&D):** High investments in R&D (Domestic companies, Foreign Direct Investments) characterize the pharmaceuticals industry in India, Malaysia, Turkey and South Africa. The other countries (Indonesia, Egypt, Ghana, Nigeria, Kenya and Tanzania have made moderate investments in R&D;
7. **Raw material sources**: Access to a reliable supply of affordable APIs and other raw materials (locally produced or imported from China and/or India) are a necessary condition for success in all the countries (100%) analysed;
8. **Financing:** In all the ten countries (100%) financing is available through either the Government or a National Healthcare Scheme or Foreign Direct Investment (FDIs);
9. **Products**: Pharmaceutical products manufactured in the countries include APIs (60%), formulations (100%) and related health commodities. Formulations are almost all generics, but packaging, labelling and distribution of some patented drugs are also undertaken;
10. **Market**: The markets are fragmented – domestic, regional and international. Access to the private sector segment of the markets is generally guaranteed for quality pharmaceutical products. However, access into the lucrative Government and donor-funded market segments are usually restricted to WHO prequalified or Stringent Regulatory Authority (SRA) approved pharmaceutical products.

[32] "Pharmerging markets" are the fastest growing pharmaceutical markets in the world

The most successful example is India

India's success to become a global producer of pharmaceuticals started in the 1950s and 1960s with a dedicated policy: establishment of state-owned companies in conjunction with public sector research organisations, such as the Council of Scientific and Industrial Research and the Indian Council of Medical Research. They prepared the ground for later industrial developments through the creation of indigenous technical capacities.

The absence of product patents (till 2005), low labour costs, a strong reverse engineering tradition, export subsidies, special economic zones, high import tariffs and other protectionist measures were the main drivers to allow India to become a global player for the production of generic medicines.

India signed the TRIPS agreement in 1994, but only had to comply fully since 2005. New patented products can no longer be copied as generics in India (the pre-2005 patented products are not affected).

Despite this, the compounded annual growth rate (CAGR) between 1995 and 2010 was 12%-15% (depending on the source of the data), as India shifted its focus on more lucrative generic markets in Europe and USA (where price levels for good quality generics are higher, and where lesser quality generics are not allowed to be marketed).

Although international companies were attracted to India, they offered limited investments to grow the pharmaceutical industry, and promised investments in R&D after the signature of the TRIPS agreements, were less than expected.

As a consequence, there is still need for more collaboration with academia for original research and supply of trained research personnel. Also a pathway is needed for building and improving regulatory infrastructure.

The shift from a 100% generic industry to R&D based innovative industry since 2005, is growing at a fast pace, for instance, India has been successful in making the first biosimilars of complex growth factors (proteins) based on biotechnology.

41. COUNTRY SUMMARIES

41.1 Introduction

Key data collected and analysed for the feasibility study and development of the strategy are summarised per country. The first summary presents the situation of SADC as a whole (consolidated figures from the 15 Member States). The summaries are presented as infographics, and can be found in Volume 2A.

Key data presented in the summaries were gathered through available sources in the public domain, mainly from organisations such as WHO, World Bank, and UNAIDS, and through country and manufacturer questionnaires developed to collect specific data necessary for this study. The questionnaires were sent for review to the SADC Technical Review Committee. A manual was developed on how to apply the questionnaires, including a list of target interviewees known to hera.

In each of the fifteen SADC countries, data were collected by local consultants contracted by hera. In 2 countries, a local consultant was supported by a hera partner. Data collection took place between August and October 2015.

Data entry was done by country study coordinators. This coordination team also verified data, and when considered necessary, the team contacted local consultants in order to clarify answers, or to request for additional information and/or feedback. The verified data were used for the feasibility study and development of the strategy. An overview of the key data as reported by consultants, and verified by the study team and Member States present at the consensus meeting in Johannesburg, South Africa, on 8 and 9 December, are presented in the summaries on the next pages.

41.2 Key definitions

The table below shows a list of key terms used in the country summaries:

Table 42 - Key terms used in the country summaries

Key term	Explanation	Source
GNI per capita, PPP (current international $)	Gross national income (GNI) converted to international dollars using purchasing power parity rates. An international dollar has the same purchasing power over GNI as a U.S. dollar has in the United States. GNI is the sum of value added by all resident producers plus any product taxes (less subsidies) not included in the valuation of output plus net receipts of primary income (compensation of employees and property income) from abroad.	http://data.worldbank.org/indicator/NY.GNP.PCAP.PP.CD
High/Middle/Low income country	As of 1 July 2015, the World Bank income classifications by GHI per capita, calculated using the World Bank Atlas method were as follows: 1. Low income: $1,045 or less 2. Lower middle income: $1,045 to $4,125 3. Higher middle income: $4,125 to $12,736 High income: $12,736 or more	http://data.worldbank.org/news/new-country-classifications-2015
Total health expenditure per capita in USD	Total health expenditure is the sum of public and private health expenditures as a ratio of total population. It covers the provision of health services (preventive and curative), family planning activities, nutrition activities, and emergency aid designated for health but does not include provision of water and sanitation	http://data.worldbank.org/indicator/SH.XPD.PCAP
Pharmaceutical expenditure	Pharmaceutical expenditure is defined as expenditures on prescription medicines and over-the-counter products. In some countries, the data also include other medical non-durable goods (adding approximately 5% to the expenditure). The spending also includes pharmacists' remuneration when the latter is separate from the price of medicines. Pharmaceuticals consumed in hospitals are excluded. Final expenditure on pharmaceuticals include wholesale and retail margins and value-added tax.	https://data.oecd.org/healthres/pharmaceutical-spending.htm
Median availability of selected generic medicines as per Global Health Observatory	Surveys of medicine availability using WHO/HAI standard methods. In individual surveys, availability is reported as the percentage of medicine outlets in which a medicine was found on the day of data collection. As baskets of medicines differ by	Adapted from http://www.who.int/medicines/mdg/MDG08ChapterEMedsEn.pdf

Key term	Explanation	Source
2007-2013	country, results are not exactly comparable across countries. Median availability is determined for the specific list of medicines in each survey and does not account for alternate dosage forms or strengths of these products or therapeutic alternatives.	
Domestic preference scheme exists (yes/no)	To allow competition with foreign counterparts on more equal terms, domestically manufactured goods and domestic contractors may be given a margin of preference when goods and works are procured following international competitive bidding	http://www.adb.org/sites/default/files/institutional-document/31483/om-j3-20130806.pdf
Infant/start-up manufacturing protection exists (yes/no)	The infant industry argument is an economic rationale for trade protectionism. The core of the argument is that nascent industries often do not have the economies of scale that their established competitors from other countries may have, and thus need to be protected until they can attain similar economies of scale.	https://en.wikipedia.org/wiki/Infant_industry_argument
Government uses TRIPS flexibilities to promote access to medicines (yes/no)	The 1994 World Trade Organization (WTO) Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) sets minimum standards for the protection of intellectual property, such as patents, in all WTO Member States. All members of the WTO must comply with the standards set by the TRIPS Agreement. TRIPS required many developing countries to begin granting patents on medicines. For example, India introduced pharmaceutical product patents in 2005 to comply with (TRIPS).	Adapted from https://en.wikipedia.org/wiki/TRIPS_Agreement
National Good Manufacturing Practices (GMP) standard exists (yes/no)	Good manufacturing practices (GMP) are the practices required in order to conform to the guidelines recommended by agencies that control authorization and licensing for manufacture and sale of food, drug products, and active pharmaceutical products. These guidelines provide minimum requirements that a pharmaceutical or a food product manufacturer must meet to assure that the products consistently are of high quality and do not pose any risk to the consumer or public.	https://en.wikipedia.org/wiki/Good_manufacturing_practice

41.3 Sources

In order to facilitate develop a country summary for SADC as a whole, we made use of publically available documents that involve all Member-States. For some Member-States updated data became available throughout the study. For these Member-States the country summaries show the update date. However, for the country summary of SADC, the same sources were used for all countries in order to come to the total situation as SADC as a whole.

Sources used for the country summaries are listed below.

Table 43 - Sources used for the country summaries

Indicator	Source	Alternative source (if applicable)
General:		
Country	http://www.who.int/countries/ago/en	
For country map: HIV, TB and/or Malaria product manufacturing site	Inception report and country questionnaires	
For country map: Pharmaceutical education (master programme on pharmaceutics)	SAGMA report 2014	
Population	http://www.who.int/countries/ago/en	
Life expectancy	http://www.who.int/countries/ago/en	*Namibia*: Namibia 2011 Census, MORTALITY REPORT, Namibia Statistics Agency, 2014 - accessed at http://cms.my.na/assets/documents/Namibia_2011_Census___Mortality_Report.pdf
Economy:		
GNI per capita, PPP (current international $) (2013)	http://data.worldbank.org/indicator/NY.GNP.PCAP.PP.CD	
High/Middle/Low income country	http://data.worldbank.org/country	
Health (3 diseases):		
Prevalence HIV	SAFAIDS/UNAIDS 2013	*Malawi*: DHS 2010 *Zimbabwe*: ZNASP III Strategic Plan 2015-2018
Number of people needing ART	SAFAIDS/UNAIDS 2013	
Number of people on ART	SAFAIDS/UNAIDS 2013	
Incidence TB	WHO Global TB Report 2014	*Malawi*: National TB survey 2014
Incidence Malaria	WHO Global Malaria report 2014	*Malawi*: Multiple Indicator Survey 2014
Health expenditure:		
Total health expenditure per capita in USD	http://www.who.int/countries/en/	*Malawi*: Malawi Resource Mapping Tool and NHA (2013-2014)
Pharmaceutical expenditure as a % of total health expenditure	WHO Pharmaceutical Country Profile (http://www.who.int/medicines/areas/coordination/coordination_assessment/en/index1.html	*Malawi*: Malawi Health Sector Resource Mapping and Expenditure Report 2014
Regional/local production:		
Availability		
Median availability of selected generic medicines as per Global Health Observatory 2007-2013	Global Health Observatory/WHO (http://www.who.int/gho/mdg/medicines/availability/en/)	
Policies:		
Government has policy paper with objective to support pharmaceutical sector through procurement process (yes/no)	Country questionnaire	

Indicator	Source	Alternative source (if applicable)
Domestic preference scheme exists (yes/no)	Country questionnaire	
Infant/start-up manufacturing protection exists (yes/no)	Country questionnaire	
Tax incentive exist (yes/no)	Country questionnaire	
Duty free importation taxes are different between Active Pharmaceutical Ingredients (API) or Finished Dosage Forms (FDF) (yes/no)	Country questionnaire	
Government uses TRIPS flexibilities to promote access to medicines (yes/no)	Country questionnaire	
R&D:		
Financing (internal and external) for researching medicines and health commodities for HIV, TB and malaria is available (yes/no)	Country questionnaire	
Regulation:		
National medicines regulatory authority exists (yes/no)	Country questionnaire	
Name of medicines regulatory authority	Country questionnaire	
National Good Manufacturing Practices (GMP) standard exists (yes/no)	Country questionnaire	
Manufacturers are regularly inspected for GMP (yes/no)	Country questionnaire	
National quality control lab for medicines exists (yes/no)	Country questionnaire	
Organisations involved in certification/licensing premises (list)	Country questionnaire	
Pro-active plan or standard to prevent production and/or importation to eliminate substandard and/or counterfeit products on the market exists (yes/no)	Country questionnaire	
Human resources:		
Total number of licensed pharmacists	WHO Pharmaceutical Country Profile (http://www.who.int/medicines/areas/coordination/coordination_assessment/en/index1.html	*Malawi*: NMRA (PMP Board)
Enough relevant skilled resources to run a regulatory authority are available (yes/no)	Country questionnaire	
Enough relevant skilled resources to run at least one GMP compliant manufacturing plant for medicines and/or commodities production are available (yes/no)	Country questionnaire	

Indicator	Source	Alternative source (if applicable)
Pharmacy educational institution exists? (yes/no)	SAGMA report 2014	
School has specific activities or master programme on pharmaceutics (yes/no)	SAGMA report 2014	
Current manufacturing:		
Number of licensed pharmaceutical manufacturers in the country	WHO Pharmaceutical Country Profile (http://www.who.int/medicines/areas/coordination/coordination_assessment/en/index1.html	*Botswana*: MOH Botswana Health Practitioners Council 2012
Manufacturers for HIV, Malaria and TB products exist (give absolute number)	Country questionnaire	
Manufacturers for HIV, Malaria and TB products willing to go for WHO pre-qualification (absolute number)	Country questionnaire	
Countries import HIV, Malaria and TB products from SADC member states (yes/no)	Country questionnaire	
Value of antiretrovirals procured with PEPFAR funds	http://www.pepfar.gov	
Value of antiretrovirals procured with Global Fund funds	GFATM PQR database (2010-2014)	
Value of anti-TB medication procured with Global Fund funds	GFATM PQR database (2010-2014)	
Value of antimalarials procured with Global Fund funds	GFATM PQR database (2010-2014)	