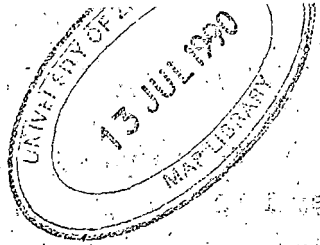


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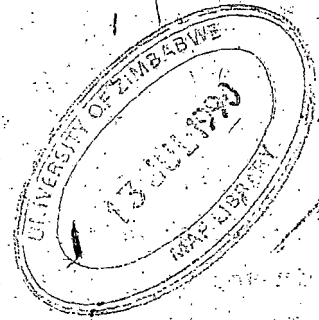


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THE MAIN ENVIRONMENTAL FACTORS RESTRICTING DEVELOPMENTIN THE U.S.S.R

By

S.M. Jinya

The USSR is the largest country in the world. It occupies about one seventh of the world's land surface (lies between latitude  $36^{\circ} \text{N}$  and  $82^{\circ} \text{N}$ ; longitude  $20^{\circ} \text{E}$  and  $192^{\circ} \text{E}$ ). Due to its sheer size the USSR has a diversity of natural resources - superior quantitatively and qualitatively to those of any other country. Despite this the USSR has many environmental constraints restricting development. Most of the environmental constraints derive from its sheer size and latitudinal location. To all these environmental constraints Parker, W.H. (1969) has applied the graphic term 'anti-resources'. Figure 1 shows the types and distribution of USSR's anti-resources.

Deriving from its latitudinal location, the USSR has cold, long winters and short, warm summers. Autumn and spring are insignificant. Apart from sheer latitudinal location the winters' severity is exacerbated by the existence of a rim of mountains in the south which cuts off warm tropical air masses and the absence of such a physical barrier in the north thereby allowing for the ingress of cold arctic and polar air streams. The winters are uniformly severe throughout and winter isotherms show no latitudinal control. So the climatological generalisation that latitudinal differences in insolation are greatest in winter only holds true for low latitudes ( $0^{\circ} - 50^{\circ} / 55^{\circ}$ ). In the northern parts of the USSR permanent frost conditions prevail. The USSR is generally arid. From this abstract one can notice that the USSR has a diversified anti-resource base just as it has a diversified resource base.

Agriculture is probably the economic sector which suffers most. Some authors have referred to Soviet agriculture as the 'permanent crisis'. Undoubtedly environmental factors have played a leading role. The growing season (summer) is short. To aggravate the situation, latitude causes lags in summer rainfall maxima, so much so that plants usually suffer from 'droughtiness' at the seedling stage. This is a crucial stage because at the seedling stage the plant is not yet established and

and the root-catchment area is limited to a few millimetres. The lag could also result in downpours when it is harvest time thereby causing extensive damage. Aridity is exacerbated by sukhovei. These are desiccating summer winds which can cause extensive damage.

Throughout many of the cultivated areas of the USSR, summertime frost is a possibility. Figure 3 illustrates the occurrence of frost in the agricultural regions of the USSR. For example the Central Ukraine and the Lower Volga may experience frosts in late August in as much as 20% of all years, in European Russia these may increase to 20-30%. Snowstorms at the seedling and tassling stages spell disaster.

The USSR is also subjected to occasional droughts. The following table illustrates that drought is a phenomenon which the Soviets have to live with. Crops thus fluctuate according to whether the year was a wet or a dry one.

Table 1: Effects of Sukhovei on Maize

Character of Drainage	Vapour pressure deficit of air	
	Lower	Upper (limits)
Beginning of reduction of turgor	12	20
Curling of leaves	16	25
Yellowing of leaves	27	29
Drying up of leaves	21	27
Severe withering	30	34

SOURCE: Lydolph, P.E. (1964)

Table 2: Recorded Frequency Droughts

Century	12th	13th	14th	15th	16th	17th	18th	19th	20th
R /one Yr.	0,04	0,02	0,08	0,04	0,05	0,07	0,10	0,17	0,23

SOURCE: Reuner, Yu. L (1977)

This table seems to indicate that there is increasing aridity in the USSR. The main reason for this apparent increasing aridity is that the Soviets

have been expanding into agriculturally marginal areas. They just could not expand northwards or eastwards because of lack of sufficient insolation. The shortcoming of a short growing season has practically been solved by the evolution of quick ripening seed strains. Aridity can be offset by irrigation and so expansion has been into marginal areas.

Figure 4 shows the difference in environmental factors between the USSR and North America. On the whole the USSR is at a disadvantage and Lydolph, P.E. (1977) states that "The fact that they (the Soviets) are beginning to compete fairly with the USA attests to their scientific endeavours to bring every drop of moisture and every calorie of heat out of their meagre climatic storehouse". Birdsall, S.S. (1968) compared six counties in Central Wisconsin, USA and Minskayo Oblast, Central Belorussia, and found out they had the same physical base and yet the six counties produced far much more per unit area. He thus concluded that there is more to it than environmental constraints.

The soil of the USSR are generally poor with the exception of a few pockets. Figure 1 shows that the area covered by poor soils (podsoils, tundra and mountain soils, solonchaks and sands) is considerable. Due to aridity erosion is rife and dust storms are catastrophic to agriculture. In the north, there are marshes and Permafrost conditions also cause waterlogging.

For economic development to occur transport is a sine qua non. The construction of the Trans-Siberian Railway had demonstrated the efficacy of transport in fostering settlement and economic development. The provision and maintenance of transport in permafrost regions is very costly. On slopes, in these regions solifluction operates and frost heaving on any surface causes rail deformations. The rivers of the USSR generally have a north-south orientation and yet main transport routes have an east-west alignment and so railway lines and roads have to cross wide flood plains and river valleys.

The resource distribution of the USSR underlines the importance of transport. The eastern regions of USSR have a qualitative and quantitative superiority of raw materials and yet  $\frac{3}{4}$  of the population and  $\frac{4}{5}$  of the industrial equipment is in the west. Transport should therefore bridge

this spatial separation.

Table 3: Eastern USSR's proportion of Resources to USSR

Coal	Natural Gas	Non-ferrous metals	Forests	Economically usable H <sub>2</sub> O resources
76%	80%	70-90%	70%	80%

The exploitation of these high grade ores is fraught with problems. Open cast mining is risky, severe climate encourages emigration and so there is a labour shortage. Rivers are frozen at certain times of the year and their north-south orientation has made them largely redundant because movement of goods is now in an east-west direction unlike in the 19th century and earlier.

Humans and machinery at certain seasons do not work at full capacity. When temperatures go below -40°C all outdoor work is suspended. At -14°C brittle deformations of various machine structures occur and at -30°C mass breakages occur. In the USSR output is seasonal, that is in summer output is high while in winter it is low. With such long cold winters it means that the time of hard work is quite short. From this, the logical thing to do is to develop some cold resistant machines. It is also important that something is done to alleviate the severity of the climate so that people would be prepared to go and work there. Better housing should be provided.

So large amounts of high grade natural resources lie 'in state' under frozen ground while the USSR relies on more accessible but inferior grades. Even if the extraction is mechanised long haulages pose problems because there are many constraints against transportation. The histogram - Figure 5, shows the utilisation of natural resources by climatic regions. There is no doubt that the utilisation pattern is to a large extent a result of environmental factors.

\* \* \* \* \*

FIGURE 1: THE "ANTI-RESOURCES" OF THE USSR

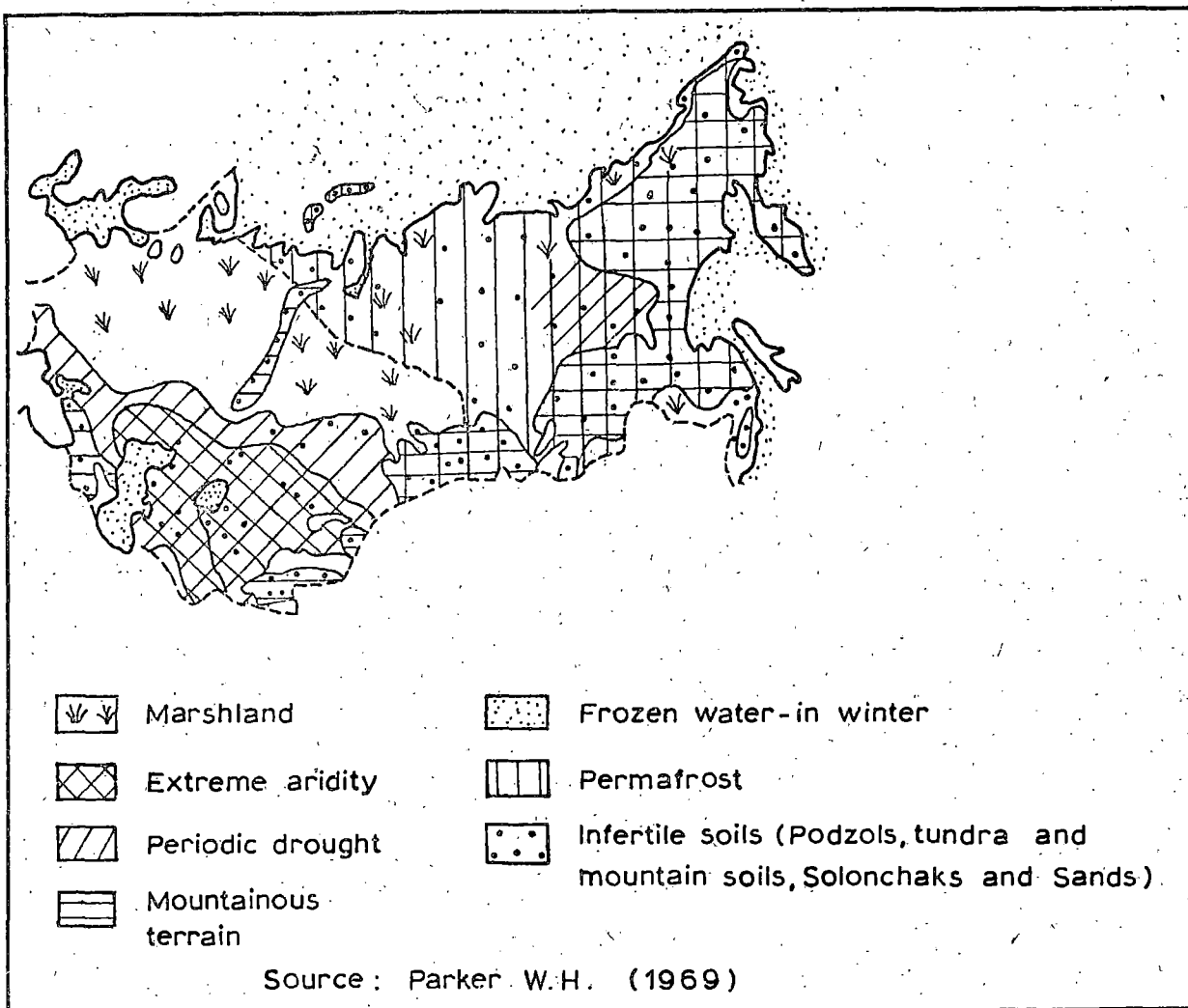


FIGURE : 2 MOISTURE AVAILABILITY

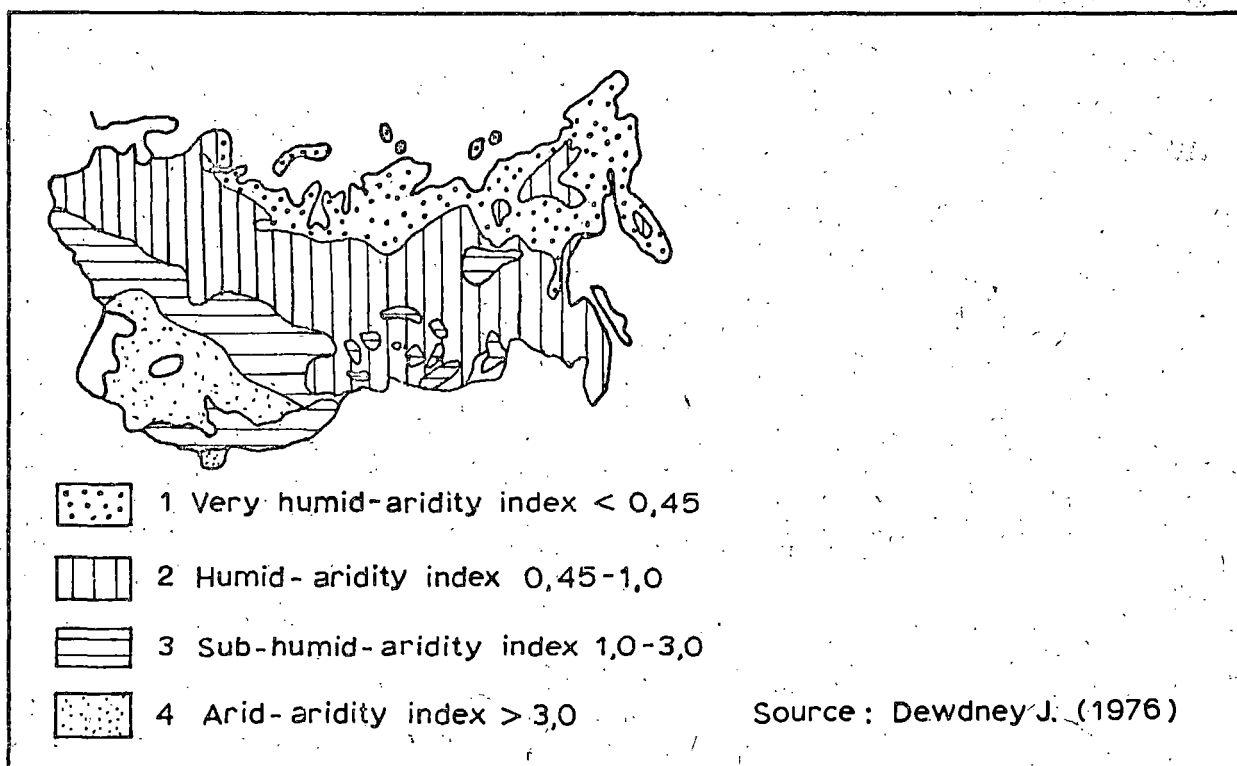
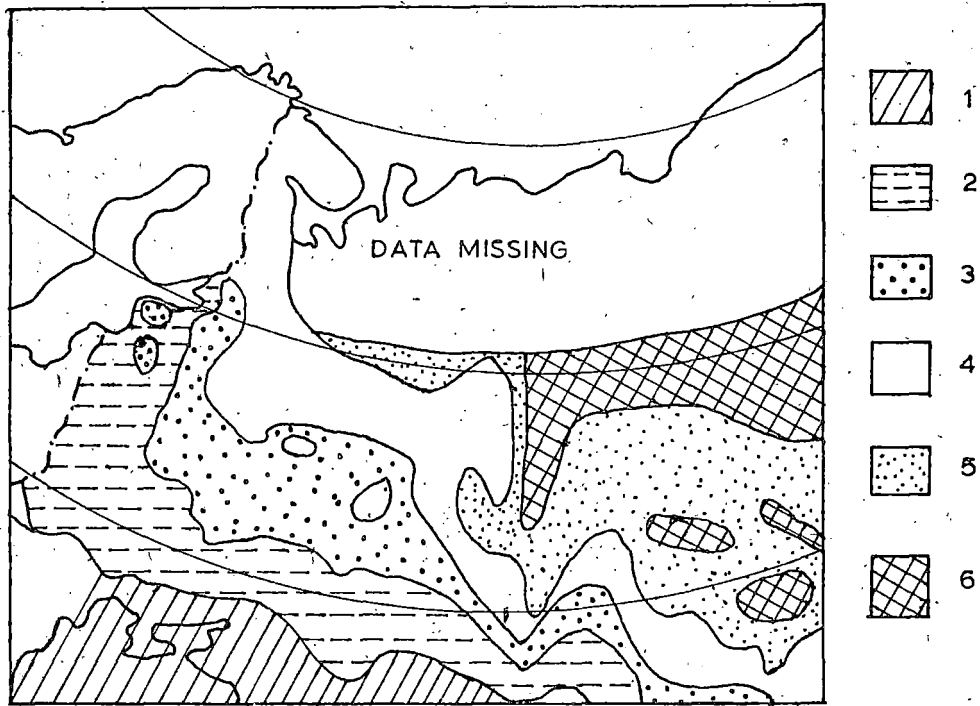


Figure 3

FREQUENCIES OF FORESTS IN JULY AND AUGUST IN OPEN PLAIN SITES



At ground surface  
no frost

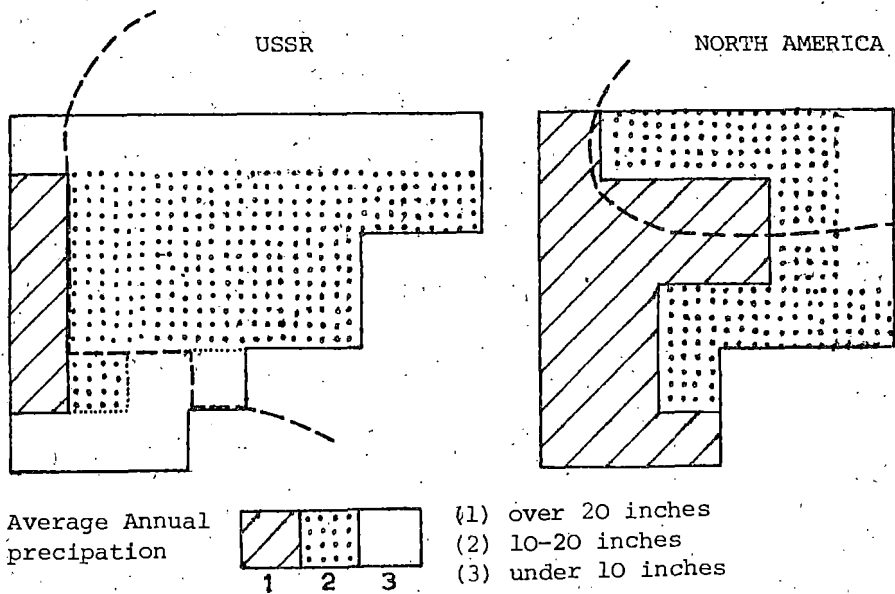
1. 5-20% in period Aug. 20-30
2. 5-20% in early August
3. 10-30% in July
4. 10-40% in early August
5. Every year in late August
6. Possible every summer

In surface Air

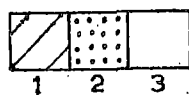
1. no frost
2. no frost
3. possible in late August
4. possible scattered frost in July and early August.
5. scattered frost every year
6. possible every summer

Figure 4

DISTRIBUTION AND AMOUNT OF PRECIPITATION AND EXTENT OF SEVERE WINTER CLIMATE IN RELATION TO THE AREAS OF THE USSR AND NORTH AMERICA.



Average Annual precipitation



- (1) over 20 inches
- (2) 10-20 inches
- (3) under 10 inches

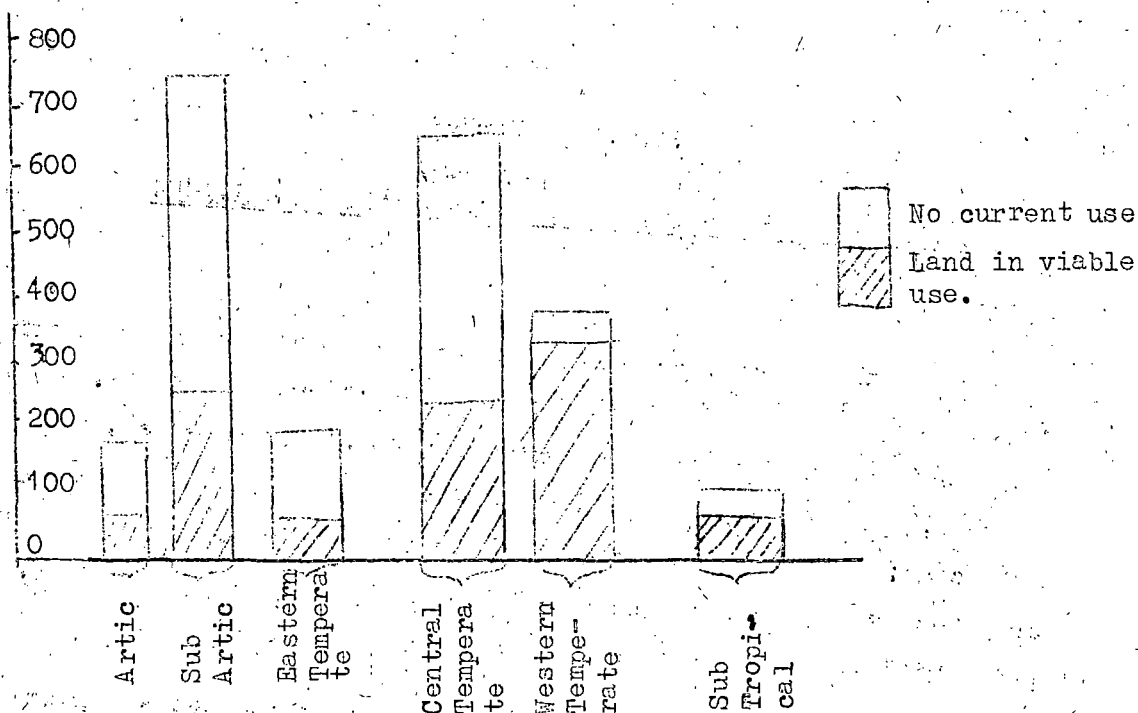
( proportion of total area (to the right of this line) having average January temperature below 0°F

SOURCE: Gregory J, (1968)



Figure 5

Quality of Available Land Resources in Actual Use by Climatic Zones



SOURCE: Mathieson, R.S. (1975)

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