Review of task force meeting I on Notec regional development

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During the first Notec Task Force Meeting (held on the 10th and 11th of May, 1978) the following papers by Polish scholars were presented:*

[1] R. Kulikowski, *Short Description of the Notec Development Project.*

[2] R. Domanski, *Contemporary conditions and Development Problems of the Upper Notec Region.*

[3] C. Somorowski, *Problems of Water Resources in the Upper Notec Agricultural Region.*

[4] J. Kostrowicki, *Introduction to Agriculture of the Upper Notec River Basin.*

[5] K. Dziewonski and P. Korcelli, *Migrations in the Upper Notec Basin.*

[6] J. Gutenbaum, M. Inkielman, I. Babarowski and H. Pietkiewicz-Saldan, *Model for Water Distribution in the Water Management System.*

[7] M. Makowski, *A Concept for Normative Modelling of Water System Development in an Agricultural Region.*

[8] R. Kulikowski, *General Methodology and Construction of System of Models for the Notec Development Project,* with two important Appendices:
I. *Regional Development Modelling - Labor, Investments and Consumption Allocation Policy Impact;* and
II. *Agriculture Model for Evaluation of Policy Impact on Production, Structural and Technological Change.*

All these materials, without exception, represent by themselves either methodological or informative contributions to regional problems, or both. They clearly show that in the Notec region a chain of overlapping problems exist which include regional irrigation, agriculture and industry growth; development of rural and urban system of services; intraregional and interregional migration; and improvement of services and regional growth. All these problems might be analyzed in their interdependence.

Water Supply

Problems of water supply are touched in the reports [1], [3], [6] and [7]. These problems arise from the fact that the precipitation is rather low (i.e. 450-500mm/year), from which only 315mm falls in the growing season. At the same time the distribution of precipitation between the years is highly uneven. Practically <u>every second year</u> is dry in terms that an amount of precipitation in a growing season, particularly in April and May, does not meet the requirements of most cultivated

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plants. All this decreases the main regional agriculture pro-
duction and does not permit the efficient use of the fertility
of the soil. And the main agricultural products are grain
(near 52%) potatoes and sugar beets (22% of cultivated land).

At the same time, the problem of water supply of industry
and system of settlements improvement exists.

In accordance with preliminary calculations [3] if one is
to satisfy all the agricultural requirements a water deficit
of about 350.10^6 cubic meters needs to be met from which 200-
250.10^6 cubic meters can be stored in artificial reservoirs and
lakes. But 90.10^6 cubic meters must be transfered additionally
from the Vistula or Warta rivers and this requires large capital
investments. Therefore one needs to be sure that the capital
investments in water regulation and channel construction are
justified by agriculural growth which is the main consumer of
this water.

This work could be done in the frame of the governmental
program on the development and utilization of water resources
for 1975-1980 created in 1974 under the general coordination
of the Institute of Meteorology and Water Economy (IMGW). The
main objective of the program is the development of a basic
scientific technical and organizational methodology, for the
realization of water resources management in industrial-urban
agglomerations and in agriculture. Within the program, special
attention is being paid to the pilot project dealing with the
development of the Notec region under the general coordination
of the Institute for Irrigation (IMUZ). This Institute is
supposed to supervise the irrigation construction project for
Notec, which is developed by the constructing Agency BIPROMEL.
The estimated Notec irrigation area is 50,000 hectares by 1985
and will increase after 1985 up to 100,000 hectares. The
project expects the production value per ha to increase from
$22-27.10^3$ Zl to $50.55.10^3$ Zl. The task is to show if this figure
will be the same, when comprehensive analyses of regional prob-
lems will be made.

To choose the best solution of water supply system a
special model for the optimization of the water system develop-
ment and control, and the allocation of water resources during
the vegetation period needs to be elaborated. As shown in [6]
and [7] some of these problems have been studied.

In [7] the aim is to construct the model for the water
resource system in an agricultural region. This model, in
reality, would be a system of four mutually connected submodels
which are oriented to solve the following problems:

a) evaluation of alternatives;
b) determination of the optimal allocation of disposable
   resources among individual microregions;
c) definition of the optimal formation of water resources; and
d) optimization of sequence of capital investments in the
   water supply system.

The main decision variables in this model are the quantities of water for irrigation in individual microregions used in different times of the vegetation period. This model (or system of models) has to be tested in practical conditions.

In [6] the problem of water distribution in a complex water resource system is analyzed. The authors consider the problem with regard to time and points of consumption within the area when the volume of precipitation is taken as random.

The main aim of water distribution consists in the minimization of losses incurred by water shortage. This means that the study of water supply problems (for the Notec project) is relatively more advanced in comparison with other directions of investigations. As the authors note:

> "The procedure proposed assumes existence of crop, soil moisture, and rainfall-runoff models. Each of these is in itself a serious problem, requiring a vast amount of research work."

One can only confirm the justice of these words.

The authors are also right when they emphasize that the determination of guarantee parameters is a matter of essential importance and that this problem should be defined from the viewpoint of global socio-economic tasks of the given region. It seems, however, that this problem must be solved on a much higher level, namely in the process of future water supply analyses, rather than during the analysis of the current problem.

Regional Agriculture

Regional agriculture problems are mainly considered in the reports by [1], [2] and [4].

The main goals of regional agriculture growth could be formulated as follows:
a) to intensify regional agriculture, to utilize fully its productive capacities, and to maximize agricultural production; and
b) to liquidate the disproportion between productivity of agriculture in the North-West and South-East parts of the region.

Regional agriculture of today is characterized by a significant differentiation between the South-East and North-West parts of the region. This differentiation is mostly due to historical developments and goes back to the period when the North-West part of the region belonged to Germany, and the South-East belonged to Russia. Conditions for the fast development of regional agriculture were suitable in the northwestern (Germany) part of the region, where the size of farms was larger and where more intensive use of the land was undertaken.

In accordance with [4]:

"In result the differences in the agrarian structure
between north-western and south-eastern parts of the
area remained considerable. While on the north-west
socialized (mostly state) farms cover about 20 per cent
or more of agricultural land, in the south-eastern part
about 4 per cent only. At the same time while on
the east medium sized farms (5-10 ha) dominate,
covering about 47 per cent of individual agricultural
land, over 15 per cent falls to the smaller (below
5 ha) farms and only about 38 per cent to larger farms
(over 10 ha), on the north-west larger farms cover
usually over 61 per cent of agricultural land, medium-
sized farms over 30 per cent and the smallest 9 per
cent of agricultural land of individual farmers."

The difference in the level of development of the two
parts is only one problem of regional agriculture. Another
problem consists of a significant differentiation in intensive-
ness of land use. According to [4] the following types of
agriculture could be identified in the region.*

1. Intensive, highly productive (70-90 conventional grain
    units per hectare of agricultural land) and commercial
    agriculture (55-65 per cent of agricultural production)
    resulting from relatively high inputs of chemcial ferti-
    lizers (over 200 kg in pure content NPK per 1 hectare of
    agricultural land), relatively high mechanization (30-40
    hectares per 1 tractor), with medium intensity of live-
    stock breeding (80-90 large animal units per 100 hectares
    of agricultural land).
2. Intensive, production (50-70 grain units) and commercial
    (50-55 percent) agriculture with slightly lower high
    chemical fertilization (150-200 kg NPK), lower mechaniza-
    tion (40-45 hectares per 1 tractor), but higher density
    of livestock (100-120 large animal units).
3. Medium intensive, medium productive (about 50 grain units)
    and, medium commercial (45-50 per cent) agriculture, with
    lower chemical fertilization (below 150 kg NPK per 1
    hectare of agricultural land) and mechanization (40-50
    hectares per 1 tractor); inputs of labor are higher (30-
    40 employed per 100 hectares of agricultural land.
4a. Intensive, productive and commercial agriculture with higher
    inputs of labor (over 30 active in agriculture per 100 hec-
    tares of agricultural land), high proportion of part-time
    farmers (70-80 per cent) have developed irrespectively of
    natural conditions in the suburban zones of certain towns,
    (Inowrocław, Nakło, etc.).

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* Some additional features of these types of agriculture are
omitted (for the sake of shortage).

4b. This variant is similar to 4a but because of the greater
distance from urban centers and poor soils it is less inten-
sive, less productive and less commercial. It has been
identified on the North, West and South-East of the area
under study.

5. Relatively extensive, low productive (about 40 grain units)
and low commercial (about 30 per cent) agriculture with lower
capital inputs (below 100 kg of fertilizers in pure content
per 1 hectare, 60-100 hectares per one hectare).

The north-western part of the region with a more advanced
agriculture, a higher proportion of socialized farms, larger
individual farms, higher capital inputs, lower labor inputs and
higher productivities could be divided into the following sub-
regions:

1. Krajna (in the extreme North) with a high proportion of
type 1 and lower proportion of types 2 and 3.

2. Bydgoszcz-Torun in the North-East with types 4a and 5.

3. Kujawy in the center with about 80% of type 1.

4. Wagrowiec in the West with types 4b and 5.

In the south-eastern part of the region agriculture type
3 prevails with types 1 and 5 of lesser importance.

Thus, a significant part of the region has medium intensive
or low intensive agriculture. Taking into account that each
second year is dry, the high potential capacities of the regional
agriculture become clear. Here one very important problem arises:
the future of private farms (the desire of farmers to intensify
their agriculture, their response to the possibilities of using
an additional amount of water, the rate of dissemination of
new progressive types of technologies through private farms,
and so on).

The image of the future farm--and firstly of the private
farm--the capability to correctly predict this, is of key
importance for the success of the Notec project.

Migration*

Two factors play a key role in future regional migration
processes:

a) the regional agricultural growth and its intensiveness, and
the kinds of technologies implemented (such as labor consump-
tion per hectare); and

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*This problem was discussed in [2] and [5].

b) growth of the adjacent cities and their role in the future
   system of settlements of Notec and the neighboring regions.

The existing situation in the Upper Notec Basin has been
characterized over the past years by a negative migration
balance which may be attributed to its predominantly rural
structure. The size of net outmigration, however, has been
small, amounting to approximately 0.5% of total population per
year, as compared to the natural increase of 1.1%.

Large parts of the Basin are contained within the migra-
tion fields of the cities of Bydgoszcz and Torun, and to a
lesser extent, within the fields of more distant provincial
capitals, in particular of Poznan and Gdansk. Also, on a
local scale, the southeastern, southern and southwestern
sections of the Basin lie within the migration fields of
Wloclawek, Konin and Gniezno, which are middle-size cities
situated just across the Basin's boundary. The only focal
point for migration, of comparable size within the Basin, is
the city of Inowrocław, which itself sends a substantial number
of migrants to both Bydgoszcz and Torun. Another feature of
intra-Basin flows is that small urban places receive the bulk
of their in-migrants from the immediate hinterland with an
exception of specialized industrial centers whose contacts are
less adversely influenced by distance.

Over two-fifths of all migrants are urban-rural, and these
migrations are evenly distributed between small, medium, and
large-sized towns.

The future existence or non-existence of a well-balanced
situation with labor demand and resources in different sectors
of the regional economy depends, firstly, on the situation of
the regional agriculture.

If the changes in local agriculture will lead only to
structural changes of employment, this problem will practically
be non-existent. If, however, local agriculture will free some
part of its employees, then migrant flows might become signifi-
cant. In this case the role of major intraregional sites
(such as Inowrocław) and adjacent sites (such as Bydgoszcz,
Wloclawek and Konin) will become a matter of importance.

Agricultural urbanization will stimulate the growth of
the so-called "dual profession" population group (peasant
workers) and ageing of the rural population. Thus, the struc-
ture of the rural population and labor force needs to be
analyzed carefully before migration flows can be assessed.

Though this problem was not specifically discussed, rural-
urban migration could lead to a decrease in the rural population
and the problem of choice of rural settlements, to develop or
disappear, needs to be solved.

It is necessary to say that we are still far from the imple-
mentation of a mathematical model for the migration processes of
the Notec region.

PROPOSALS FOR THE CONSTRUCTION OF A SYSTEM OF MODELS

This problem was analyzed in the paper by Kulikowski [8] who proposed to introduce a system which consists of the following three groups of models:

a) regional benefit models;
b) water system expansion models; and
c) water system management models.

The idea of introducing "regional benefit models" is very clear: to find the place of the Notec region in the national economy from the point of view of justified consumption of capital investments and use of the optimal size of labor. An estimation of the excess or shortage of labor resources in the given region (as for each one) is the central problem at this stage.

In Appendix I of RM-78-40, an optimum labor allocation and economic impact of labor migrations model is presented. It is based on the "Cobb-Douglas" production function and its aim is to provide one with an estimate of labor resource use in different regions of the country and thus, enables the estimation of the excess or shortage of labor resources in each particular region.

To assess the influence of migration on the regional economy a special model is proposed in Appendix I. The model derives the migration ratio as a function of available jobs and housing and as an income ratio (in comparison with the national average level). The complete structure of such a model, comprising demographic, employment, economical, consumption, housing and environmental submodels is also shown. In this version migration becomes "the center" of regional problems which deserve precise analysis. For some regions, where migration is a key problem, such a concentration of different submodels centered around migration could be justified.

In the migration model, the population income is used. The income of the rural population depends significantly on the size of farms and on the kinds of technology used. In order to investigate the private agriculture sector, from the point of view, a special model was elaborated (see Appendix II). Its main goal is to estimate the optimal farm size as a key characteristic of this (which defines consumption of labor, capital, etc. as well as the level of expenditures and income).

With regard to the water system expansion models, one can refer to the report by Makowski [7]. The problem of water control and regulation is analyzed by Gutenbaum et al [6]

SOME ADDITIONAL PROBLEMS

Some important additional problems arise in the report by Domanski [2]. Among these the following deserve to be mentioned:

1. Behavior of private farmers under new conditions when significant amounts of water become available; their desire to intensify land use; conditions which could stimulate appropriate reaction of the peasants.

2. Change in number and structure of agricultural employees; growth of agriculture processing product; organization of technical services (e.g. seed, forrage production, etc.).

3. Future development of rural settlements, choice of the center of different order and non-perpective villages.

4. Development of an intraregional urban settlements system, when the influence of large adjacent towns outside the region is very strong; role of this system in providing services for rural areas.

5. Possibility of using an irrigation project for the development of a tourist-recreation system.

6. Pressing need to improve the system and quality of existing roads, and what is necessary from the viewpoint of facilitating technical and material transportation as well as improving communication and access to cultural centers.

7. General development of a system of services in urbanized as well as hinterland areas.

All of the above mentioned problems deserve deeper investigation in the following stages of the Notec problem analysis.

ASSESSMENT OF THE NOTEC REGIONAL PROBLEM

Though the water irrigation project is a starting point of regional development analysis, it is not a single, or major problem of future regional development. The water supply problem is only the first of many important links in a chain which leads to comprehensive regional problem solution. Among others one could mention:

1. General improvement of regional agriculture.

2. Equalization of development in northwestern and southeastern parts of the region.

3. Estimation of the number of jobs in future regional agriculture, of rural-urban migration flows and effective use of labor in regional agriculture and other sectors of the economy.

4. Improvement of the rural system of settlements and services, choice of rural "poles of growth", definition of the role of intraregional big towns alongside with that of adjacent towns.

5. Problems of general improvement of a system of technical and social services including the expansion and improvement of a system of roads, shops, etc.

All of the aforementioned lead to the following assessment of the main goals of Notec regional development:

Economic Goals:

a) maximize economically justified regional agriculture production growth; and

b) eliminate the inequity between the northwestern and southeastern sections of the region.

Social Goal: to accelerate the growth in the standard of living in rural areas and to bring this closer to that of urban areas which also need to be improved in accordance with the country's standard. To achieve these goals one needs to modernize the rural (mostly) and urban system of settlements and services. These goals of regional development could contradict with those of the national economy (for example, in the case of scarcity of the country's capital investments and the impossibility of supplying the region with the required capital investments). Another main source of contradition between local and central plans could be the number of employed in the region from the point of view of achieving the best results for the country as a whole. To get these plans of different levels to coincide, one needs to elaborate a local (regional) plan as a function of at least two variables: capital investments and the number of employed.

This means that for each amount of capital investments in the regional economy, one needs to have this optimally distributed between the sectors (in the case of Notec, it means between irrigation, agriculture, local industry, house construction, services, etc.). If such a calculation is done for different levels of employees in the region under study, then a basis for coordination of the regional and country's plans of economic development exists.